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NOTE: THIS BOOKLET IN COMBINATION WITH DWG NO 501-4870233 SUPERSEDES TYPE PLAN S3801-1398157, "VENT GENERAL NOTES & DETAILS".

THERE IS A TOTAL OF 31 SHEETS IN THIS DRAWING WHICH INCLUDES 1A & 1B.

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, D.C. 20362

NORFOLK NAVAL SHIPYARD
PORTSMOUTH, VIRGINIA

SCALE: NONE	
DRAWN BY TARKENTON & FOLEY (S) DATE 10.27-78	BRANCH SUPVR. J.H. Harward (S)
TRACED BY —	CHIEF DESIGN ENGR. J.R. Dutton (S)
CHECKED BY SHOP 17 & CODE 262	

ABBREV. TITLE: VENT GEN NOTES SURFACE SHIPS

VENTILATION GENERAL NOTES FOR SURFACE SHIPS

SIZE	FSCM NO.	WT GRP	NAVSEA DWG NO.	REV
A	53711	501	4870232	D
		CODE 262	SHEET 1 OF 29	

D																														
D	D	D	-	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D		D	D	D	D	D	D	D	D	D	D	D
C	B	B	B	B																										
29	30	31	32	33																										
C	C		B	B	C	C	C	C	C	C	B	B	B	B	B	C	B	C	B	B	B	B	C	B	B	B	B	B	B	B
1	1A	1B	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	17A	18	19	20	21	22	23	24	25	26	27	28

REVISION STATUS OF SHEETS

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
A3	SH 4 - DWG NO ADDED TO REF 2-6 SH 5 - REF 32-35 ADDED SH 6, 19, 28 - EDITORIAL CHANGES MADE TO UPGRADE BOOKLET & TO SUIT REF 1, REV "A". CEF 9/25-79	10/31/79	(S)
B	MODIFIED NOTES 1-C, 6-C, 35-C, 40-C, 41-C, 2-T, 3-T, 4-S, 1-L, 4-L, 5-L, 8-L, 10-L, 8-1, 11-1, 20-1 ADDED NOTE 11-L CEF 11/32/82	4/1/83	(S)
C	ADDED SH 1A REVISIONS & REVISION STATUS. SH 3 - ADDED NOTE 8 REV STATUS SH TO TABLE OF CONTENTS. SH 4 - REMOVED REF NO. 2, ADD NEW DWG NO FOR REF 3 & 5. SH 5 - ADDED REF NO 35. SH 6 - CHANGED NOTE 2-C. SH 7 - CHANGED NOTE 5-C, 6-C C, & 6-C D. SH 8 - ADDED NOTE 6-C G & H. SH 9 - CHANGED NOTE 19-C. SH 15 - CHANGED NOTE 35-C. SH 17 - DELETED NOTE 41-C (3) SH 21 - CHANGED NOTE 4-S (A) SH 29 - CHANGED MATERIAL (GASKET) NOTE 9-1. JPH 3/4/90	2/15/90	(S)

— CON'T —

SIZE	FSCM NO.	WT GRP	NAVSEA DWG NO.	REV
A	53711	501	4870232	D
SCALE: N/A			SHEET 1A	

REVISIONS (CONTD)

REV	DESCRIPTION	DATE	APPROVED
D	SHEET NO: 1 - NUMBER OF SHEETS MODIFIED 1A - REVISION STATUS BLOCK MODIFIED 1B - ADDED SHEET 1B, REVISIONS 3 - TABLE OF CONTENTS, SHEET NUMBERS AND NOTES MODIFIED 4 - REFERENCE LIST, TITLES AND DRAWING NUMBERS MODIFIED 5 - REFERENCE LIST, TITLES AND DRAWING NUMBERS MODIFIED ADDED REFERENCE 36 AND 37 6 - NOTE 3-C DESIGNATED AS SUCH 7 - NOTES 4-C, 6-C-E AND 6-C-G MODIFIED 8 - NOTE 6-C-G, ADDED SKETCH 9 - NOTES 14-C AND 19-C MODIFIED 12 - NOTE 34-C MODIFIED 13 - NOTE 34-C (3) AND 34-C (4) MODIFIED 14 - NOTES 35-C AND 36-C MODIFIED 15 - NOTE 37-D AND 41-C-1 MODIFIED 16 - NOTES 42-C AND 43-C MODIFIED 18 - ADDED NOTE 2-T (F) NOTES 3-T (C) AND 3-T (G) MODIFIED 22 - ADDED NOTE 1-L(C) 23 - NOTES 4-L (A), 4-L (B) AND 4-L (D) MODIFIED 25 - NOTES 4-I, 5-I AND 6-I MODIFIED 27 - NOTES 11-I (C) AND 11-I (D) MODIFIED 29 - TABLE "E" MODIFIED	4/22/92	Mehnick

SIZE	FSCM NO.	WT GRP	NAVSEA DWG NO.	REV
A	53711	501	4870232	D
SCALE: N/A			SHEET 1B	

INTRODUCTION

THE PURPOSE OF THIS BOOKLET AND THE RELATED STANDARD DETAILS IS TO ESTABLISH A GENERAL GUIDE FOR THE DESIGN, CONSTRUCTION AND ERECTION OF VENTILATION/AIR CONDITIONING DUCT SYSTEMS FOR NAVAL SURFACE SHIPS. PORTIONS OF THE RELATED GUIDANCE FROM THE GENERAL SPECIFICATIONS FOR SHIPS OF THE UNITED STATES NAVY ARE CONTAINED HEREIN ALONG WITH GUIDANCE CONSISTANT WITH GOOD DESIGN/SHOP PRACTICES. USERS SHOULD TAKE NOTE THAT THE VARIATIONS FOUND IN THE DIFFERENT TYPES OF SHIPS WITH WHICH THIS FACILITY IS CONCERNED WILL NECESSITATE OCCASIONAL AND SELECTIVE DEVIATION FROM THIS GUIDE. FURTHER, IT IS INTENDED THAT RELATED DESIGN AND CONSTRUCTION CRITERIA CHANGES THAT OCCUR IN THE FUTURE WILL BE REFLECTED THROUGH MODIFICATION TO THESE GENERAL NOTES AND STANDARD DETAILS.

TABLE OF CONTENTS

(D)(C) NOTE: THERE IS A TOTAL OF 31 SHEETS IN THIS DRAWING.

SIZE	FSCM NO.	WT GRP	NAVSEA DWG NO.	REV
A	53711	501	4870232	D
SCALE: N/A			SHEET 3	

REFERENCES

	TITLE	DWG. NO.
1.	VENTILATION - STANDARD DETAILS FOR SURFACE SHIPS	501-4870233
2.	~~FOUNDATIONS FOR NAVY STD. FANS (NOT SUITABLE FOR GR. "A" SHOCK)~~	~~S3801-1546597~~
3.	VENT STD FAN FDN FOR SURFACE SHIPS	501-6068890
4.	NNSDD VENT HEATING & COOLING COIL MOUNTING DETAILS GR "C" SHOCK	STD. 3330793
5.	VENT HEATING & COOLING COIL MOUNTING DETAILS GRADE "A" SHOCK	501-4722272
6.	VENTILATION PRECIPITATOR FOUNDATIONS SUITABLE FOR HI-SHOCK	501-4554766
7.	BELLMOUTH INTAKE FOR VENTILATION FANS FOR SHIPBOARD USE	810-451223
8.	CIRCULAR DIFFUSING TERM. FOR AIR CONDITIONING SYSTEMS	804-690702
9.	TYPE "E" ADJUSTABLE BLAST TERMINALS	805-860481
10.	ACCESS COVER, ROUND FOR NWT DUCT, 6" DIA, QUICK OPENING TYPE ASSEMBLY	805-1363772
	ACCESS COVER, ROUND FOR NWT DUCT, 8" DIA, QUICK OPENING TYPE ASSEMBLY	805-1363773
	ACCESS COVER, ROUND FOR NWT DUCT, 12" DIA, QUICK OPENING TYPE ASSEMBLY	805-1363774
	DETAILS & LIST OF MATERIAL	805-1363775
	ACCESS COVER, ROUND FOR NWT DUCT, QUICK OPENING TYPE, ARRANGEMENT IN CURVED OR ROUND DUCTS & ADDITIONAL DETAILS	805-1363776
11.	VENTILATION STANDARD ACCESS PLATES	501-1131916
12.	AIR FILTER HOUSING	803-5001044
13.	STANDARD HIGH-EFFICIENCY FILTER INSTL.	501-1131922
14.	FLAME ARRESTER & FILTER ASSEMBLY	S3801-1231181
15.	NAVY STD. AIR FILTERS FOR SHIPBOARD USE	804-1170895
16.	VANEAXIAL FAN	803-921784
17.	CENTRIFUGAL FAN - CC TYPE	803-5001058
18.	TUBEAXIAL FAN, TYPE L	810-925368
19.	UNIT COOLERS - CLASS UW & UF	805-1311398
20.	COOLING COILS - GRAVITY TYPE CL GF & GW	S3803-532636
21.	COOLING COILS - 50 SERIES	805-1310894
22.	COOLING COILS - 47 & 48 CL. DW & DF	805-1749027
23.	UNIT HEATER	S3802-521735

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A	53711	501	4870232	D
SCALE: N/A			SHEET 4	

REFERENCES (CONT'D)

	TITLE	DWG. NO.
24.	CONVECTION HEATERS	S3802-921624
25.	NAVY STD. VENTILATION HEATERS (TYPES S & T)	S3802-66970
26.	CLOSURE, VENTILATION , WATERTIGHT & FIRE RESISTANT, MODEL "R" ROUND	805-1749102
27.	CLOSURE, VENTILATION, WATERTIGHT & FIRE RESISTANT, MODEL "K" FLAT OVAL	805-1749103
28.	AIR FILTER GAGES	805-1577080
29.	STATIC TIP ASSY FOR DIFF. PRESS. GAGES	501-1660074
30.	A/C VENTILATION & HTG. DESIGN CRITERIA MANUAL FOR SURFACE SHIPS OF THE UNITED STATES NAVY	——
31.	GENERAL SPECIFICATIONS FOR SHIPS OF THE UNITED STATES NAVY	——
32.	VENTILATION STANDARD TYPE "F" COVER	501-1131919
33.	VENTILATION STANDARD TYPE "M" COVER	501-1131910
34.	VENTILATION STANDARD THERMOSTATIC CONTROL DETAILS	501-1131903
(C) 35.	FND FOR CLG COILS (GRAVITY COILS)	113-1131341
(D) 36.	ACCESS COVERS VENT QUICK ACTING	803-6397256
(D) 37.	GENERAL SPECIFICATION FOR OVERHAUL OF SURFACE SHIPS (GSO)	——

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SCALE: N/A			SHEET 5	

DUCT DESIGN AND CONSTRUCTION NOTES

1-C ALL DUCTWORK, WATERTIGHT AND NON-WATERTIGHT, SHALL BE CONSTRUCTED OF ONE OF THE FOLLOWING MATERIALS: ALUMINUM, FED. SPEC. QQ-A-250/8 OR ASTM B-209, ALLOY 5052: GALVANIZED SHEET STEEL, FED. SPEC. QQ-S-775, TYPE I, CLASS D: HOT ROLLED STEEL, ASTM A569, GALVANIZED AFTER FABRICATION TO EQUAL QQ-S-775 WHEN DUCTWORK IS 0.125 INCH THICK OR LESS. (SEE NOTE 1-C (A) FOR EXCEPTION). THE MINMUM THICKNESS FOR DUCTWORK FABRICATED FROM SHEET MATERIAL SHALL BE AS INDICATED IN TABLE "A".

TABLE "A" - SHEET FOR FABRICATED DUCTWORK

DIAMETER OR LONGER SIDE	NON-WATERTIGHT THICKNESS			WATERTIGHT THICKNESS		
	GALV. STL	USSG	AL	GALV. STL	USSG	AL
6" AND LESS	.018	28	.025	.075	14	.106
6-1/2" TO 12"	.030	22	.040	.100	12	.140
12-1/2" TO 18"	.036	21	.050	.118	11	.160
18-1/2" TO 30"	.048	18	.060	.118	11	.160
ABOVE 30"	.060	16	.080	.118	11	.160

(A) UNLESS OTHERWISE NOTED ON ARRANGEMENT PLANS, WHERE STEEL REQUIRED FOR DUCTWORK AND PLENUMS OF EXHAUST SYSTEMS WITHIN 10 FEET OF THE WEATHER DISCHARGE AND SUPPLY SYSTEMS FROM THE WEATHER INTAKE INBOARD IS 11 USSG OR HEAVIER, IT SHALL BE UNGALVANIZED HOT ROLLED STEEL, ASTM-A569 (SEE NOTE 41-C FOR REQUIRED TREATMENT OF INTERNAL SURFACES OF VENTILATION SYSTEMS IN THESE AREAS). ALL OTHER STEEL DUCT MATERIAL SHALL MEET THE REQUIREMENTS OF NOTE 1-C ABOVE, EXCEPT COAMING MATERIAL HEAVIER THAN 11 USSG NEED NOT BE GALVANIZED.

2-C SEAMLESS OR WELDED TUBING MAY BE USED FOR ROUND OR FLAT-OVAL DUCTWORK. MACHINE BENDING OF TUBING IS ALLOWABLE. TUBING, WHEN USED, SHALL CONFORM TO THE MINUMUM THICKNESS AS SHOWN IN TABLE "B".

TABLE "B" - WELDED OR SEAMLESS TUBING

TUBING SIZE	NON-WATERTIGHT AL	WATERTIGHT AL
2" TO 6"	.035	.106
6-1/2" TO 12"	.050	.140

3-C (D) (C) COMERCIALLY MANUFACTURED SPIRALLY WOUND GALVANIZED STEEL OR ALUMINUM DUCT AND FITTINGS MAY BE USED FOR ROUND OR FLAT-OVAL NON-WATERTIGHT DUCTWORK. TABLE "C" PROVIDES MINMUM THICKNESS OF MATERIAL FOR SPIRALLY WOUND DUCT. SPIRALLY WOUND DUCT IS DRIPPROOF AND MAY BE INSTALLED OVER ELECTRICAL/ ELECTRONICS EQUIPMENT.

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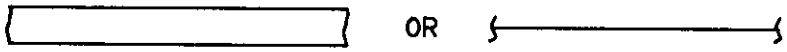
TABLE "C" - SPIRALLY WOUND DUCT

NON-WATERTIGHT

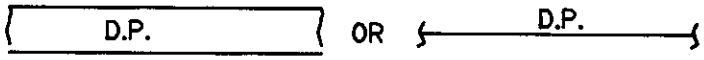
DIAMETER	GALV STL	USSG	AL
8" AND LESS	.018	28	.025
ABOVE 8"	.030	22	.032

4-C (D) DUCTS THAT PASS THROUGH OR ARE EXTENSIONS OF COMPARTMENTS SUBJECT TO TIGHTNESS TESTS AND DUCTS THAT SERVE AS SPRINKLING OVERFLOWS FOR AMMUNITION SPACES SHALL BE INCREASED IN THICKNESS AS NECESSARY TO WITHSTAND THE TEST PRESSURE WITHOUT PERMANENT SET. WHERE THIS OCCURS, THE REQUIRED MATERIAL THICKNESS SHALL BE NOTED ON THE VENTILATION ARRANGEMENT PLAN.

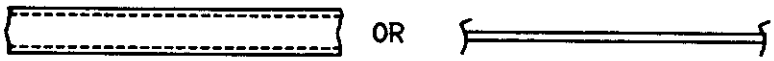
5-C NON-WATERTIGHT DUCTS AND BRANCHES ARE INDICATED ON THE PLANS IN THE FOLLOWING MANNER:



(C) DRIPPROFF INDICATED THUS -



WATERTIGHT DUCTS AND BRANCHES ARE INDICATED THUS -



(MAY BE SHOWN INTERMITTENT)

6-C JOINTS AND SEAMS IN NWT STEEL & ALUMINUM DUCTS

A. LONGITUDINAL SEAMS FOR 18 THRU 28 USSG STEEL AND FOR ALUMINUM, .050" THICK AND LESS ARE TO BE LOCK JOINTED, LAPPED AND RIVETED, OR WELDED WHERE DESIRED FOR EASE OF FABRICATION.

B. LONGITUDINAL SEAMS FOR 16 USSG STEEL AND FOR .060" AND .080" THK ALUMINUM ARE TO BE WELDED OR MAY BE LAPPED AND RIVETED WHERE DESIRED FOR EASE OF FABRICATION.

(C) C. CONNECTING JOINTS FOR NWT DUCTS MAY BE EITHER FLANGED, LAPPED AND RIVETED OR WELDED. ROUND DUCT SIZES 3" TO 10" DIA. MAY ALSO BE CONNECTED BY AN APPROVED BANDED TYPE SLEEVE CONNECTOR (DETAIL 72 OF REFERENCE 1 TYPICAL) FLANGES OR SLEEVE CONNECTORS SHALL BE PROVIDED IN SUFFICIENT NUMBER TO PROVIDE READY PORTABILITY.'

(C) D. ALUMILASTIC MAY BE USED AS NECESSARY TO ENSURE TIGHTNESS OF ALL SEAMS AND JOINTS. USE DUCT SEALANT "3M-800" FOR DRIPPROOF APPLICATION.

(D) E. RIVETED SEAMS SHALL HAVE A 3/4" LAP FOR ROUND DUCTS AND 1" LAP FOR RECTANGULAR DUCTS WITH 3/16" RIVETS SPACED ON NOT MORE THAN 2" CENTERS. AT DISCRETION OF SHOP, ~~STEEL DUCT SEAMS MAY BE SOLDERED IN LIEU OF RIVETED.~~

F. SLIP JOINTS AND SHEET METAL SCREWS SHALL NOT BE USED IN DUCT CONSTRUCTION.

(D) (C) G. THE EXHAUST VENTILATION DUCTWORK FROM THE LAUNDRY AREAS SHALL BE MADE OF WELDED CONSTRUCTION ONLY. THE USE OF RIVETS IS PROHIBITED FOR THE LAUNDRY EXHAUST VENTILATION DUCTWORK EXCEPT AS SHOWN ON SHEET 8.

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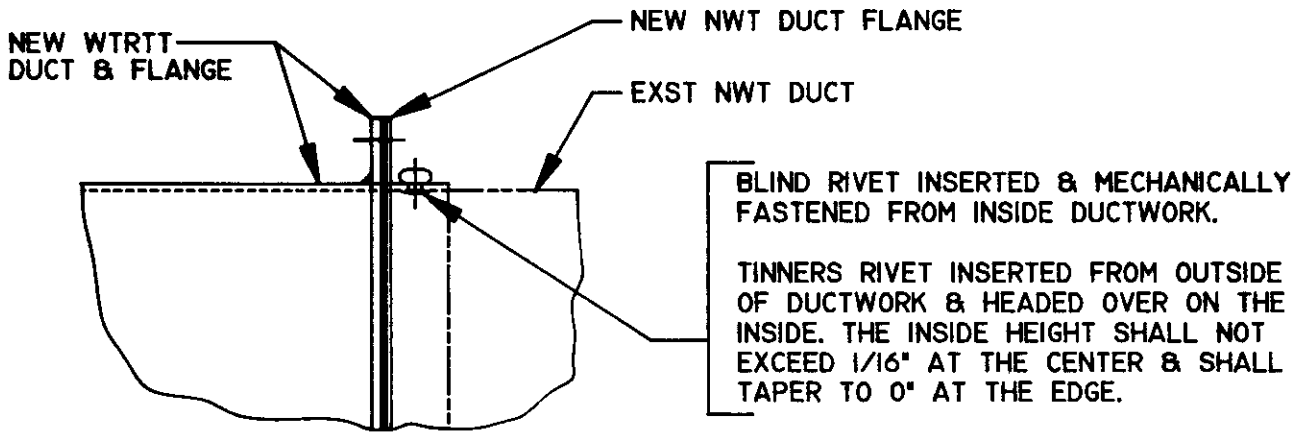
SCALE: N/A			SHEET 7	

6-C JOINTS AND SEAMS IN NWT STEEL & ALUMINUM DUCTS (CONT'D)

(D) G. CONTINUED



7-C JOINTS AND SEAMS IN WTRTT DUCTS

A. ALL LONGITUDINAL SEAMS SHALL BE WELDED.

B. ALL CONNECTING JOINTS SHALL BE WELDED EXCEPT THAT A MINMUM OF WTRTT FLANGED JOINTS MAY BE USED WHERE PORTABILITY IS DESIRED AND/OR TO FACILITATE INSTALLATION.

8-C DIMENSIONS GIVEN ON VENTILATION ARRANGEMENT PLANS FOR UNINSULATED OR THERMALLY INSULATED DUCTS ARE INSIDE DIMENSIONS. WHEN ONE DIMENSION IS GIVEN, IT IS UNDERSTOOD THAT THE DUCT IS CIRCULAR IN SECTION. WHEN TWO DIMENSIONS ARE GIVEN, IT IS UNDERSTOOD THAT THE DUCT IS RECTANGULAR IN SECTION. FLAT OVAL DUCTS ARE DESIGNATED BY THE LETTERS FO. THE FIRST DIMENSION LISTED IS THE VISIBLE SIDE OF THE DUCT. FOR INTERNAL ACOUSTICALLY INSULATED DUCTS, SEE NOTE 8-L, SHEET 27.

9-C THE THICKNESS OF MATERIAL FOR ELBOWS, TEES, FITTINGS AND TRANSITIONS SHALL BE EQUAL TO THAT REQUIRED FOR THE LARGEST DIMENSION OF THE CONNECTING DUCT.

10-C ELBOWS FOR WTRTT AND NWT ROUND DUCT SHALL BE MADE IN ACCORDANCE WITH DETAIL 10 AND 11, REFERENCE 1, RESPECTIVELY.

11-C WHERE RADIUS OF BEND IS NOT GIVEN ON ARRANGEMENT PLAN, IT SHALL BE UNDERSTOOD THAT THE RADIUS IS EQUAL TO THE DUCT DIAMETER, IF ROUND, OR THE WIDTH OF DUCT IN PLANE OF BEND, IF RECTANGULAR OF FLAT OVAL. RADUIS TO BE TAKEN TO THE INSIDE OF THE BEND. RADII MAY BE REDUCED WHERE NECESSARY TO CLEAR INTERFERENCES.

12-C THE RATIO OF THE LARGE TO SMALL DIMENSION ON FLAT-OVAL OR RECTANGULAR DUCTS SHALL NOT EXCEED 3.5 TO 1, EXCEPT THAT INTERNAL DIVISION PLATES MAY BE USED TO MAINTAIN THIS REQUIREMENT.

13-C COMPANION FLANGES SHALL BE TEMPLATED TO VENDOR FLANGE TEMPLATES WHEN PROVIDED, OR TO THE FLANGES OF WTRTT CLOSURES, FANS, HEATERS COOLING COILS, FLAME ARRESTERS AND MANUAL CUT-OFF DAMPERS WHERE REQUIRED.

14-C (D) DUCTS MARKED WITH AN ASTERISK (*) ON THE PLAN OF THE VENTILATION ARRANGEMENT DRAWING INDICATES A CHANGE IN LEVEL. TANGENT ELBOWS SHALL BE USED FOR MINOR LEVEL CHANGES. WHEN THE CHANGE OF LEVEL IS UTILIZED TO CLEAR AN INTERFERENCE WITH ANOTHER SYSTEM OR WITH STRUCTURE THE ASTERISK MAY BE LOCATED & THE DEGREE OF CHANGE NOTED. SEE DETAIL 1, REFERENCE 1.

15-C BRANCHES ARE TO BE TAKEN FROM DUCTS AT 30 DEGREES TO THE DIRECTION OF THE AIR FLOW UNLESS OTHERWISE NOTED ON THE VENTILATION ARRANGEMENT PLANS, OR WHERE INTERFERENCES OCCUR AT INSTALLATION.

16-C NWT DUCT TRANSFORMATION LENGTHS WILL ALLOW FOR FLANGE ATTACHMENT AND/OR CONNECTION TO ADJACENT DUCT. SEE DETAIL 2, REFERENCE 1.

17-C WHEN THE LENGTH OF A TRANSFORMATION IS NOT GIVEN ON THE ARRANGEMENT DRAWING, THE ANGLE OF THE SLOPE SHALL BE 15 DEGREES FOR SYMMETRICAL CONES. FOR CONES NOT SYMMETRICAL, THE INCLUDED ANGLE OF THE CONE SHALL NOT EXCEED 30 DEGREES. SEE DETAIL 2, REFERENCE 1.

18-C THE BOTTOM OF THE CONNECTING TRANSFORMATION ON THE DISCHARGE SIDE OF DUCT COOLING COILS SHALL BE INCLINED UP AT LEAST 15 DEGREES FOR A DISTANCE EQUAL TO OR GREATER THAN THE VERTICAL DIMENSION OF THE COIL FACE TO PROVIDE DRAINAGE FOR WATER CARRY-OVER FROM THE COIL.

19-C (C) (D) ALL DUCT, ELBOWS, ETC., SHALL BE SMOOTH INSIDE AND FREE FROM PROJECTING LIPS OR OTHER OBSTRUCTIONS, EXCEPT NECESSARY OBSTRUCTIONS SUCH AS STIFFENING PLATES, DAMPERS, CLOSURES, SPLITTERS, VANES AND ORIFICE PLATES WHOSE LEADING EDGES SHALL BE ROUNDED OR FOLDED BACK. THIS REQUIREMENT DOES NOT EXCLUDE THE USE OF RIVETS, EXCEPT IN LAUNDRY EXHAUST VENTILATION DUCTWORK WHICH IS WELDED CONSTRUCTION ONLY. (SEE 6-C-G)

20-C WHERE CORNER RADII ARE REQUIRED ON RECTANGULAR DUCT, THE CONNECTING DUCT NEED NOT BE FAIRED IN IF THE REDUCTION IN AREA IS 5% OR LESS. SEE DETAIL 2, REFERENCE 1.

21-C NWT DUCTS HAVING ONE DIMENSION OVER 24" WIDE ARE TO BE FITTED WITH INTERNAL CENTERLINE STIFFENING PLATES OF THE SAME GAGE MATERIAL AS THE DUCTWORK, 12" LONG AND SPACED ON 36" CENTERS, PARALLEL TO THE AIR FLOW, EXCEPT AS NOTED BELOW. AN INTERNAL STIFFENING PLATE NEED NOT BE ADDED IF THE LOCATION OF THE PLATE IS WITHIN 15" OF A FLANGE. AS AN ALTERNATE TO INTERNAL STIFFENING, NWT DUCTS MAY BE FITTED WITH 1" X 1" X 1/8" ANGLE, EXTERNAL STIFFENING, WRAPPED AROUND THE DUCT ON 42' CENTERS EXCEPT AS NOTED ON ARRANGEMENT PLANS. WHERE BOTH DUCT DIMENSIONS EXCEED 24", USE ONLY 1" X 1" X 1/8" ANGLE EXTERNAL STIFFENING SPACED ON 42" CENTERS, OR CLOSER, AS NECESSARY. SEE DETAIL 13 ON REFERENCE 1. WTRTT DUCTS BELOW THE TEST HEAD ARE TO BE STIFFENED IN ACCORDANCE WITH DETAIL 14, REFERENCE 1. THOSE ABOVE THE TEST HEAD OVER 30" WIDE WILL BE STIFFENED IN ACCORDANCE WITH DETAIL 13, REFERENCE 1. EXTERNAL STIFFENING ON WTRTT DUCTS IS TO BE 1" X 1" X 1/8" ANGLE WRAPPED AROUND THE DUCT ON 42" CENTERS UNLESS OTHERWISE NOTED ON THE ARRANGEMENT PLANS. EXTERNAL STIFFENING MAY BE OMITTED IN WAY OF FLANGES WHICH FALL WITHIN 6" OF THE INDICATED STIFFENER. ANGLES ON NWT CONSTRUCTION ARE TO BE RIVETED OR WELDED: AND WELDED ONLY ON WTRTT CONSTRUCTION. (1/8 ∧ 3-61

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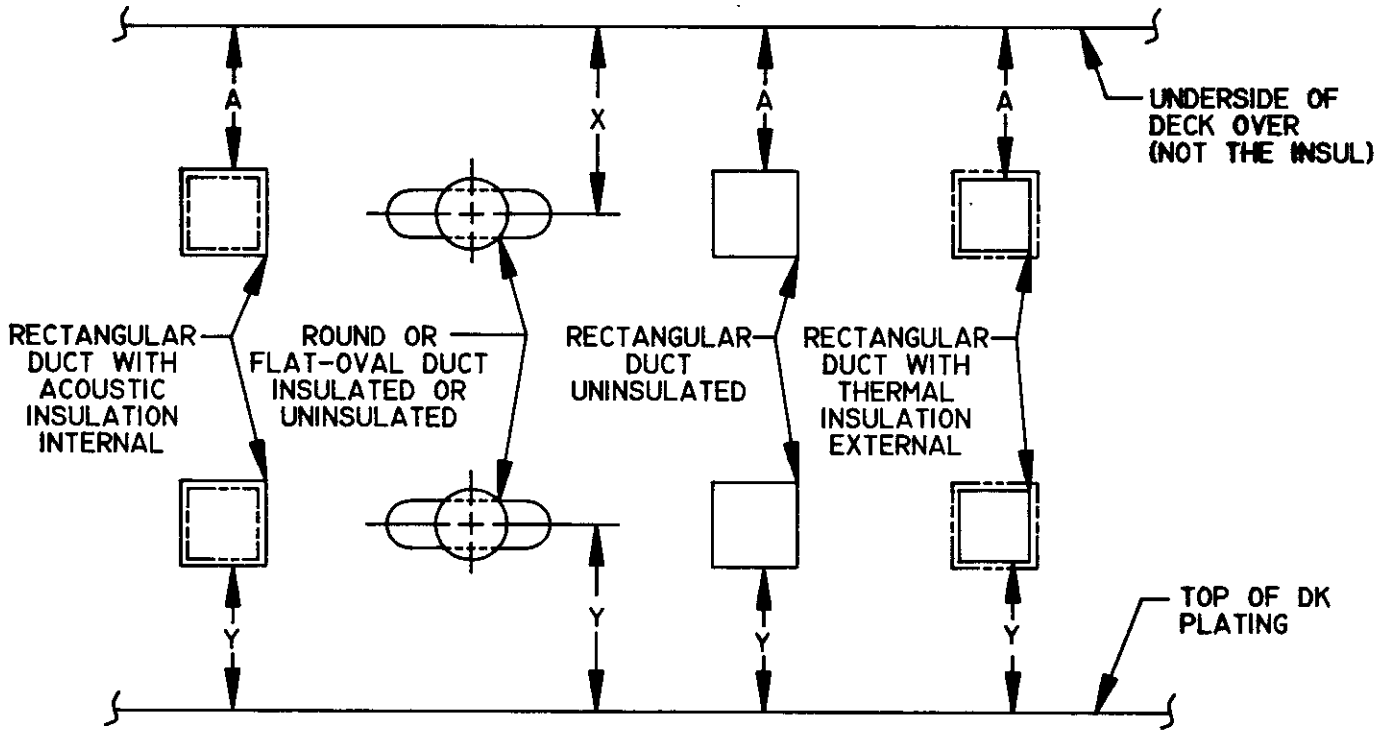
SCALE: N/A			SHEET 9	

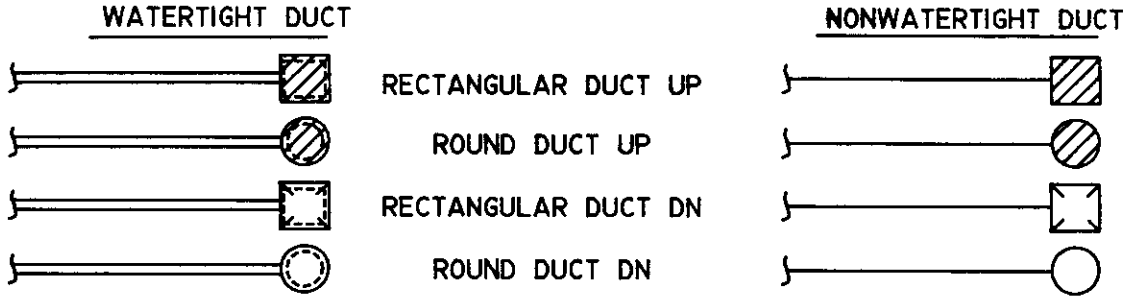
22-C THE LETTERS "X", "A" AND "Y" DENOTE THE DUCT LOCATION FROM DECKS AS SHOWN IN THE FOLLOWING EXAMPLE:



23-C THE MOLDED LINE FOR DECK PLATING IN MOST INSTANCES IS THE UNDERSIDE OF THE DECK, FORMING A FLUSH SURFACE FROM WHICH OVERHEAD DUCTWORK IS LOCATED. THEREFORE, "A" & "X" DIMENSIONS FOR DUCTS IN MOST CASES ARE GIVEN THUS: A OR X = 5.

24-C WHEN DECK SURFACE FROM WHICH LOCATING DIMENSIONS ARE TAKEN IS NOT FLUSH, SUCH AS IN WAY OF INSERT PLATES AT TRANSVERSE BENTS, "A" AND "X" DIMENSIONS ARE NOTED THUS: A OR X = 4 (5), IN WHICH CASE THE FIRST DIMENSION IS BELOW THE INSERT PLATE AND THE SECOND DIMENSION IS BELOW THE NORMAL DECK PLATING.

25-C WHEN VENT DUCTS ARE INDICATED BY A SINGLE LINE, AS SHOWN BELOW, DIMENSIONS TO ROUND DUCTS ARE TO THE CENTERLINE: DIMENSIONS TO RECTANGULAR DUCTS ARE TO THE NEAR SIDE.



NOTE 25-C CONTINUED ON SHEET 11

SIZE	FSCM NO.	WT GRP	NAVSEA DWG NO.	REV
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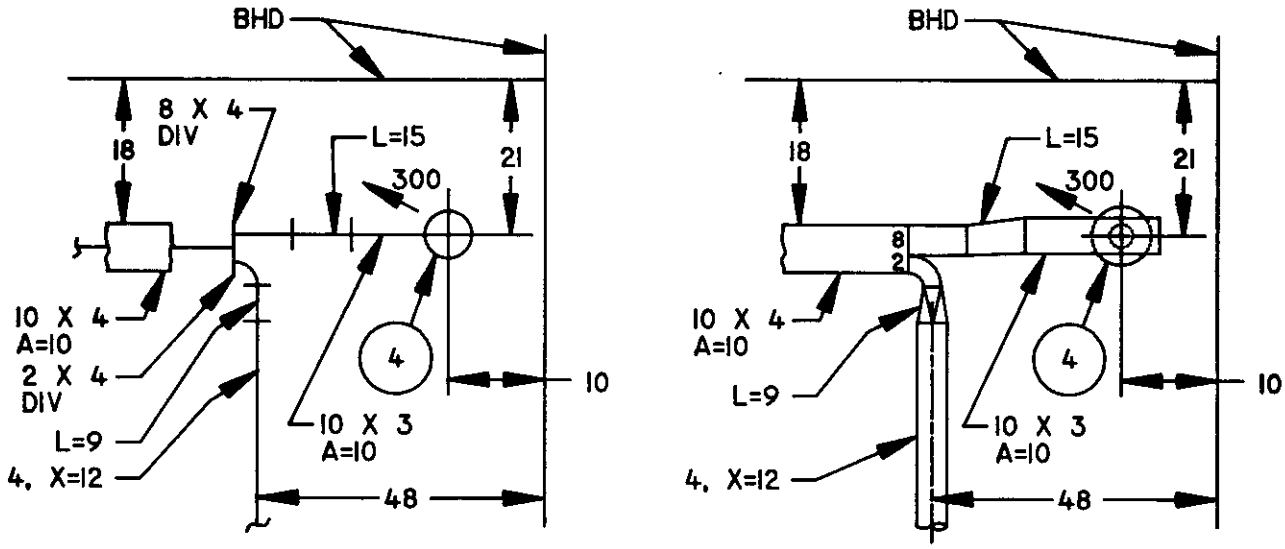
SCALE: N/A			SHEET 10	

25-C CONTINUED



26-C LOCATING FOR DUCTWORK SHALL BE TAKEN FROM THE NEAR SIDE OF ALL STRUCTURE AND SHALL BE SO INDICATED ON VENTILATION ARRANGEMENT PLANS. SEE NOTES 22-C AND 25-C.

27-C AIR VOLUMES ARE GIVEN IN CUBIC FEET PER MINUTE (CFM). AIR VELOCITIES ARE GIVEN IN FEET PER MINUTE (FPM).

28-C THE SPACING OF FLANGES AND THE LENGTH OF DUCT SECTIONS SHALL BE SUCH AS TO PERMIT SHIPPING OF DUCT SECTIONS THROUGH DOORS AND HATCHES AND TO FACILITATE INSTALLATION.

29-C WHERE FLANGES ARE RIVETED TO DUCT WALL, ALUMILASTIC MAY BE USED AS NECESSARY TO ENSURE NOMINAL TIGHTNESS. SEE DETAIL 6 & 7, REFERENCE 1.

30-C TO ENSURE UNIFORM AIRFLOW AT AXIAL FLOW FAN INTAKES, COILS, HEATERS AND AT SUPPLY SYSTEM TAKE-OFFS, THE PRECEDING TURN AND DUCTWORK SHALL BE IN ACCORDANCE WITH THE FOLLOWING RULES:

A. RADIUS ELBOWS MAY BE USED, PROVIDED THE MINMUM LENGTH OF STRAIGHT DUCT BETWEEN THE TURN AND THE FITTING IS EQUAL TO THE DUCT DIMENSION IN THE PLANE OF THE BEND TIMES:
   2, FOR 30 DEGREE ELBOWS
   3, FOR 45 DEGREE ELBOWS
   4, FOR 60 DEGREE ELBOWS
   5, FOR 90 DEGREE ELBOWS

B. RADIUS ELBOWS WITH SPLITTERS MAY BE USED, PROVIDED THE MINIMUM LENGTH OF STRAIGHT DUCT BETWEEN THE TURN AND THE FITTING IS EQUAL TO THE DIMENSION BETWEEN THE LONGEST SPLITTER AND THE OUTER CURVE OF THE ELBOW TIMES:
   2, FOR 30 DEGREE ELBOWS
   3, FOR 45 DEGREE ELBOWS
   4, FOR 60 DEGREE ELBOWS
   5, FOR 90 DEGREE ELBOWS

C. VANED TURNS SHALL BE USED IF THE LENGTH OF STRAIGHT DUCT BETWEEN THE TURN AND THE FITTING IS LESS THAN THAT REQUIRED BY (A) & (B) ABOVE: OTHERWISE, RADIUS ELBOWS ARE PREFERED.

31-C THE DESIGN OF DUCTWORK ON THE INTAKE SIDE OF FANS IS GOVERNED BY THE FOLLOWING:

A. AXIAL FANS:
EVERY EFFORT SHALL BE MADE TO KEEP THE INTAKE TRANSITION SYMMETRICAL. IF IT IS NECESSARY TO DECREASE THE VELOCITY AT FAN INTAKES, THE TRANSFORMATION SHALL BE SYMMETRICAL OR THE INTAKE SHALL BE FITTED WITH STRAIGHT PIPE FOR A LENGTH OF ONE DIAMETER. BRANCH INLETS OR SPLIT MAINS ARE NOT PERMITTED IN THE DUCTWORK PRECEDING THE AXIAL FAN FOR A DISTANCE EQUAL TO THE FAN DIAMETER. BELLMOUTHS SHALL BE INSTALLED AT FAN INTAKES WHERE THERE IS NO INLET DUCTING OR WHERE FAN SUCTION IS TAKEN FROM A PLENUM CHAMBER.

B. CENTRIFUGAL FANS:
IF A SQUARE TURN IN A RECTANGULAR DUCT OCCURS IMMEDIATELY BEFORE THE FAN INLET, THE DIMENSION OF THE SIDE OF THE ELBOW PARALLEL TO THE FAN SHAFT SHALL NOT BE LESS THAN 3/4 OF THE FAN INLET DIAMETER AND THE OTHER DIMENSION SHALL BE EQUAL TO THE FAN INLET DIAMETER. THE DUCT SHALL BE FAIRED INTO THE FAR EDGE OF THE FAN INLET ON A RADIUS TURN OF 3/4 FAN INLET DIAMETER.

32-C WHEN DESIGNING VENTILATION/AIR CONDITIONING SYSTEM ADDITIONS OR MODIFICATIONS INVOLVING ROTATING EQUIPMENT INSTALLATION, CONSIDERATION SHALL BE GIVEN TO THE SHIP'S NOISE AND VIBRATION CRITERIA AND TO THE POSSIBLE NEED TO RESILIENTLY MOUNT THE EQUIPMENT.

33-C FLEXIBLE JOINTS SHALL BE INSTALLED AT THE FAN/DUCT CONNECTIONS IF THE FANS ARE RESILIENTLY MOUNTED.

34-C (D) (1) ACCESS OPENINGS FOR CLEANING SHALL BE LOCATED WITHIN 12 INCHES OF THE EQUIPMENT OR FITTING & SHALL BE PROVIDED IN THE FOLLOWING LOCATIONS:

(a) ON EACH SIDE OF DUCT HEATERS AND DUCT COOLING COILS, EXCEPT FOR DUCT COOLING COILS WHICH ARE DIRECTLY MOUNTED TO AIR FILTER HOUSINGS OR TO MODULAR TYPE ELECTROSTATIC PRECIPITATORS. IN THESE CASES AN ACCESS SHALL BE PROVIDED ON THE AIR LEAVING SIDE OF DUCT COOLING COILS AND ON THE INLET SIDE OF FILTERS/PRECIPITATORS.

(b) ON THE AIR OUTLET SIDE OF FLAME ARRESTERS.

(c) ON THE AIR INLET SIDE OF ORIFICE PLATES AND ELBOWS WITH EITHER TURNING VANES OR SPLITTERS.

(d) AT THE IMPELLER (INLET) END OF AXIAL FANS & AT THE INLET OF CENTRIFUGAL FANS.

(e) IN EXHAUST DUCTS SERVING THE LAUNDRY, GALLEY, SCULLERY, OXYGEN-NITROGEN PRODUCER ROOM, AND MACHINERY SPACES SO THAT ALL INTERIOR AREAS OF THE DUCTS FROM THE EXHAUST INLET TO THE WEATHER CAN BE REACHED AND CLEANED BY HAND (NOT MORE THAN 6 FEET APART).

(f) IN RECIRCULATION DUCTWORK UPSTREAM OF THE AIR FILTER.

(g) IN EXHAUST DUCTS FROM SANITARY SPACES FROM TERMINAL TO MAIN OR UP TO 25 FEET FROM TERMINAL WHICHEVER IS THE LARGER DISTANCE.

(2) ACCESS OPENINGS SHALL BE LOCATED IN THE BOTTOM OF THE DUCT UNLESS THE SIDE OR TOP IS MORE ACCESSIBLE. ACCESSES SHALL BE LOCATED TO ENSURE THAT THEY WILL BE READILY ACCESSIBLE WITHOUT FIRST DISMANTLING OTHER INSTALLATIONS.

34-C CONTINUED

(D) (3) NON-WATERTIGHT DUCTWORK ACCESS:

(A) ACCESS FOR DUCTS THAT ARE LESS THAN 6 INCHES IN WIDTH SHALL BE BY MEANS OF A REMOVABLE, FLANGED SECTION OF DUCTWORK, 18 INCHES TO 24 INCHES LONG, WITH SLOPING FLANGES AT ONE END. THE REMOVAL SECTION SHALL BE LABELED, "REMOVABLE SECTION-DO NOT OBSTRUCT".

(B) ACCESS FOR DUCTS THAT ARE 6 INCHES OR GREATER IN WIDTH SHALL BE BY ONE OF THE FOLLOWING MEANS:

(a) QUICK ACTING ACCESS COVERS IN ACCORDANCE WITH NAVSEA DRAWING 803-6397256.

(b) ACCESS PLATE WITH OPENING EQUAL TO THE WIDTH OF THE DUCT, LESS A TOTAL OF 2 INCHES, TO ALLOW FOR PLATE ATTACHMENT. THE ACCESS OPENING SHALL BE 18 INCHES TO 24 INCHES LONG, IF THE LENGTH OF DUCTWORK OR TRANSITION WILL PREMIT. ACCESS PLATES SHALL BE IN ACCORDANCE WITH METHOD "A", DETAIL 46, REFERENCE 1.

(c) IN EXHAUST SYSTEMS SERVING THE LAUNDRY, GALLEY, SCULLERY, OXYGEN-NITROGEN PRODUCER ROOM AND MACHINERY ROOMS, REMOVABLE ACCESS COVER PLATE IN THE DUCTWORK SHALL HAVE A QUICK-OPERATING ROUND OR FLAT OVAL COVER INSTALLED IN THE FIRST ACCESS COVER PLATE AFTER THE AIR INLET AND IN EVERY FOURTH ACCESS COVER PLATE THEREAFTER.

(d) REPLACEMENT QUICK-OPERATING ROUND ACCESS COVERS SHALL CONFORM TO DRAWING, NAVSHIPS NOS. 805-1363772, 805-1363773, 805-1363774, 805-1363775, AND 805-1363776, AND FLAT-OVAL ACCESS COVERS SHALL CONFORM TO DRAWING, NAVSHIPS NO. 501-1131916. QUICK-OPERATING ACCESS COVERS SHALL BE SECURED TO THE REMOVABLE ACCESS PLATE BY A 1/16-INCH 7- BY 7-WIRE ROPE OF COMPATIBLE MATERIAL AT LEAST 8 INCHES IN LENGTH.

(D) (4) WATERTIGHT DUCTWORK ACCESS:

(A) ACCESS FOR DUCTS THAT ARE LESS THAN 6 INCHES IN WIDTH SHALL BE BY MEANS OF A REMOVABLE, FLANGED SECTION OF DUCTWORK, 18 INCHES TO 24 INCHES LONG, WITH SLOPING FLANGES AT ONE END. THE REMOVAL SECTION SHALL BE LABELED, "REMOVABLE SECTION-DO NOT OBSTRUCT".

(B) ACCESS FOR DUCTS THAT ARE 6 INCHES OR GREATER IN WIDTH SHALL BE BY MEANS OF AN ACCESS PLATE. THE ACCESS OPENING SHALL BE EQUAL TO THE WIDTH OF THE DUCT, LESS A TOTAL OF 2 INCHES, TO ALLOW FOR PLATE ATTACHMENT. THE ACCESS OPENING SHALL BE 18 INCHES TO 24 INCHES LONG, IF THE LENGTH OF DUCTWORK OR TRANSITION WILL PERMIT. ACCESS PLATE SHALL BE IN ACCORDANCE WITH METHOD "B" OR "C", DETAIL 46, REFERENCE 1.

(C) ACCESS FOR DUCTS BETWEEN A FLAME ARRESTER AND THE COMPARTMENT SERVED SHALL BE BY MEANS OF A REMOVABLE, FLANGED SECTION OF DUCTWORK, 18 INCHES TO 24 INCHES LONG, WITH SLOPING FLANGES AT ONE END. THE REMOVABLE DUCT SECTION SHALL BE LABELED, "REMOVABLE SECTION - DO NOT OBSTRUCT".

35-C (D) DUCT SECTIONS OVER THE FOLLOWING AND SIMILAR EQUIPMENT SHALL BE AVOIDED IF AT ALL POSSIBLE:

(1) COMPUTERS
(2) CONTROL PANELS
(3) ELECTRONIC EQUIPMENT
(4) GENERATORS
(5) GENERATOR TERMINALS
(6) LOAD CENTER AND POWER DISTRIBUTION PANELS
(7) SWITCHBOARDS
(8) TRANSFORMER TERMINALS

(C) WHEN MOISTURE FROM ANY SOURCE COULD BE PRESENT IN DUCT SECTIONS LOCATED OVER SUCH EQUIPMENT, THE DUCTWORK SHALL BE EITHER WATERTIGHT CONSTRUCTION OR MADE DRIPTIGHT BY WELDING, SOLDERING, USE OF DUCT SEALANT 3M-800, USE OF SPIRAL WOUND DUCTWORK OR BY THE INSTALLATION OF STRAIGHT DUCT SECTIONS WITH THE SEAM AT THE TOP. AS A MINIMUM, THIS TREATMENT SHALL EXTENT FOR A DISTANCE OF NOT LESS THAN ONE FOOT BEYOND EACH SIDE OF THE EQUIPMENT. DUCTS SHALL BE ARRANGED TO PRECLUDE DUCT CONNECTIONS (JOINTS OR FLANGES) OVER EQUIPMENT. IN SPACES WHERE THE ARRANGEMENT OF ELECTRICAL/ELECTRONIC CONTROL EQUIPMENT IS EXTENSIVE, VENTILATION DUCTS SERVING OR PASSING THROUGH THE COMPARTMENT SHALL BE EITHER DRIPTIGHT OR WATERTIGHT CONSTRUCTION.
EXAMPLES OF DUCTWORK REQUIRING DRIPTIGHT OR WATERTIGHT CONSTRUCTION ARE:
(1) RECIRC SYSTEM SUPPLY DUCTS WHERE MOISTURE CARRY-OVER FROM THE COIL IS SUBJECT TO EXTENDING INTO THE DUCT SYSTEM. (DUCTS MAY BE EXCLUDED FROM THIS REQUIREMENT WHERE AMPLE PROTECTION AGAINST MOISTURE IS OBTAINED BY DESIGN OF THE DISCHARGE TRANSITION IN ACCORDANCE WITH NOTE 18-C OR WHERE AN AIR LIFT/PLENUM MAY BE USED ON THE DOWNSTREAM SIDE OF THE COIL.)

(2) WEATHER SUPPLY DUCTS WHERE ENTRAINED MOISTURE MAY BE PRESENT. (NOTE THAT AIR VELOCITIES LESS THAN 500 FEET PER MINUTE ARE NECESSARY FOR ENTRAINED MOISTURE TO SEPARATE FROM THE AIR FLOW IN A PLENUM OR AIR LIFT CONDITION)

(3) EXHAUST DUCTS FROM MOISTURE LADEN ENVIRONMENTS (ALSO SEE NOTE 36-C)

36-C (D) EXHAUST DUCTS FROM SCULLERIES WITH DISHWASHERS SHALL BE DESIGNED SO THAT OPTIMUM DRAINAGE OF MOISTURE IS OBTAINED AND IN ADDITION, THEY SHALL BE MADE OF STEEL CONSTRUCTION & DRIPTIGHT BY THE METHODS NOTED IN NOTE 35-C FROM THE SPACE TERMINAL TO THE WEATHER.

37-C SCREENS SHALL BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING:
A. EIGHT MESH, .035 INCH DIAMETER, ALUMINUM WIRE SCREEN SHALL BE INSTALLED IN ALL SUPPLY TERMINALS IN THE FOLLOWING COMPARTMENTS:
(1) ELEVATOR PIT (SUBJECT TO GASOLINE SPILLAGE)
(2) AVIATION GUN CLEANING ROOM (WHERE FLAMMABLE SOLUTIONS ARE USED)
(3) ALCOHOL STOREROOMS
(4) GASOLINE FUELING STATIONS (NOT OPEN TO THE WEATHER) AND ALL OTHER GASOLINE SPACES.
(5) AVIATION STOREROOM (FLAMMABLE)
(6) FLAMMABLE LIQUIDS STOREROOM
(7) GAS CYLINDER STOREROOM (FLAMMABLE)
(8) PAINT MIXING AND ISSUE ROOM

37-C CONTINUED

B. TO PROVIDE RATPROFFING IN SPACES WHERE FOOD IS STORED OR PREPARED, OPEN END (BLAST-TYPE) SUPPLY TERMINALS AND EXHAUST TERMINALS SHALL BE FITTED WITH 1/2" GALVANIZED STEEL OR ALUMINUM, .064" DIAMETER WIRE MESH.

C. ALL OTHER EXHAUST TERMINALS ARE TO BE FITTED WITH 1-1/2", GALVANIZED STEEL OR ALUMINUM, .125" DIAMETER WIRE MESH UNLESS OTHERWISE NOTED.

(D) D. IN ORDER TO PREVENT INJURY TO PERSONNEL OR THE FOULING OF DUCTS, THE OPEN END OF AXIAL FLOW FANS AND ALL WEATHER OPENINGS ARE TO BE PROVIDED WITH 1-1/2", STEEL, GALVANIZED, .125" DIAMETER WIRE MESH SCREENS. AN EXCEPTION IS MADE FOR WEATHER INTAKES PROVIDING DIRECT CONNECTED ENGINE COMBUSTION AIR WHERE 1/2" GALVANIZED STEEL, .108" DIAMETER, WIRE MESH SHALL BE INSTALLED. IN OPENINGS OF 9" DIAMETER OR 9 X 9 RECTANGLE OR LESS, 1/2" MESH SCREEN MAY BE USED INSTEAD OF 1-1/2" MESH SCREEN.

E. SCREENS SHALL NOT BE FITTED ON THE FACE OF HEATERS OR THE DISCHARGE END OF FANS THAT EXHAUST INTO UPTAKE SPACES, EXCEPT AS REQUIRED TO PREVENT INJURY TO PERSONNEL.

F. IF ANY OF THE FOREGOING WOULD RESULT IN MULTIPLE SCREENS, ONLY THE FINE MESH SCREEN SHALL BE INSTALLED UNLESS THE FINE MESH SCREEN NEEDS SUPPORT, IN WHICH CASE A SECOND SCREEN IS PERMITTED.

G. VENTILATION SCREENS SHALL BE ACCESSIBLE AND EASILY REMOVABLE. EXHAUST TERMINAL SCREENS SHALL BE SECURED TO THE TERMINAL BY A 1/16", 7 BY 7 WIRE ROPE APPROX. 8" LONG (SEE DETAIL 33, REFERENCE 1).

38-C A MANUALLY OPERATED DAMPER, FOR TEMPERATURE CONTROL, SHALL BE INSTALLED IN THE BRANCH SERVING EACH COMPARTMENT ON A ZONE HEATING/COOLING SYSTEM EXCEPT THE BRANCH SERVING THE SPACE IN WHICH THE THERMOSTAT IS INSTALLED.

39-C DAMPER HANDLES ARE TO BE LOCATED ON BOTTOM EXCEPT WHEN NOTED OTHERWISE ON THE ARRANGEMENT PLAN.

40-C (1) COAMINGS FOR DUCT PENETRATIONS SHALL BE OF THE THICKNESS, MATERIAL AND LOCATION AS SPECIFIED ON THE VENTILATION ARRANGEMENT DRAWING.

(2) COAMINGS SHALL BE IN ACCORDANCE WITH DETIAL 18 THROUGH 25 OF REFERENCE 1.

(3) WHERE RIPOUT OF VENTILATION SYSTEMS WITH STRUCTURAL PENETRATIONS IS REQUIRED, COAMING REMOVAL SHALL BE LIMITED. CONSIDERATION SHALL BE MADE TO PROVIDING PATCH PLATES FOR TIGHTNESS INTEGRITY, ETC. WHERE COAMINGS ARE REMOVED FROM SHIPS STRUCTURE, PATCH PLATES OF LIKE MATERIAL SHALL BE REQUIRED ON THE ARRANGEMENT PLANS.

41-C PROTECTION AGAINST CORROSION OF THE INTERNAL SURFACES OF VENTILATION DUCTWORK SHALL BE PROVIDED AS FOLLOWS:

(D) (1) FOR DUCTWORK AND PLENUMS OF 11 USSG OR HEAVIER, UNGALVANIZED STEEL EXHAUST WITHIN 10 FEET OF THE WEATHER DISCHARGE AND SUPPLY DUCTWORK AND PLENUMS FROM THE WEATHER INTAKE SCREEN TO THE POINT WHERE LIGHTER MATERIAL MAY BE USED, THERMAL SPRAYED ALUMINUM COATING, 7-10 MILS THICK, IN ACCORDANCE WITH DOD-STD 2138(SH) SHALL BE APPLIED.

41-C CONTINUED

(2) AS AN ALTERNATE TO THE PREFERENCE STATED ABOVE, SURFACES SHALL BE PAINTED WITH TWO COATS OF EPOXY-POLYAMIDE PRIMER, FORMULA 150, TO MIL. SPEC. MIL-P--24441.

(C) ~~(3) DUCTWORK AND PLENUMS OF ALUMINUM EXHAUST WITHIN 10 FEET OF THE WEATHER DISCHARGE AND ALL ALUMINUM SUPPLY DUCT SHALL BE PAINTED INTERNALLY WITH TWO COATS OF FORMULA 150, TO MIL. SPEC. MIL-P-24441.~~

(4) INTERNAL SURFACES OF DUCTS HANDLING CORROSIVE FUMES SHALL BE COVERED WITH ONE OF THE FOLLOWING:

(A) SYNTHETIC RUBBER, MIL. SPEC. MIL-R-15058.

(B) FOUR (4) COATS OF EPOXY-POLYAMIDE PAINT, MIL. SPEC. MIL-P-24441, (ONE (1) COAT OF FORMULA 150 PRIMER, THREE (3) COATS OF FORMULA 151/152).

(C) PLASTIC PLASTISOL, MIL. SPEC. MIL-P-20689, TYPE I (DIP-COATING PROCESS).

PAINTING OF INTERNAL SURFACES OF ALUMINUM OR GALVANIZED STEEL DUCTS AND TRUNKS IS NOT REQUIRED.

(5) EXTERNAL SURFACES OF DUCTWORK SHALL BE PAINTED THE SAME AS THE ADJACENT STRUCTURE, EXCEPT WHERE ANTI-SWEAT COATING IS USED (SEE NOTE 1-L (B). EXTERNAL SURFACES OF ALUMINUM AND STEEL DUCTWORK SHALL BE PREPARED FOR PAINTING IN ACCORDANCE WITH PREPARATION GIVEN TO ADJACENT STRUCTURE. WHERE EXCEPTIONS TO THE PRECEDING REQUIREMENTS OCCUR, AS IN THE CASE OF VENTILATION NUCLEAR AND/OR RELATED SPACES, SPECIAL REQUIREMENTS SHALL BE NOTED ON THE VENTILATION ARRANGEMENT PLANS.

42-C (D) WHEN CONDITIONS DICTATE A NECESSITY TO COMBINE TWO OR MORE VENTILATION SYSTEMS INTO A SINGLE DUCT, THE COMBINATION SHALL BE OF WELDED CONSTRUCTION WITH WATER-TIGHT DIVISION PLATES SEPARATING THE INDIVIDUAL SYSTEMS. WHERE SUPPLY AND EXHAUST SYSTEMS OR HEATED AND UNHEATED SYSTEMS ARE COMBINED IN THIS MANNER, INSULATION SHALL BE APPLIED TO THE HOT SIDE OF THE DIVISION PLATE IN ACCORDANCE WITH NOTE 10-L.

43-C (D) WEATHER INLETS AND OUTLETS SHALL BE DESIGNED TO PREVENT SEA WATER, DRIVING RAIN OR SPRAY FROM ENTERING THE SHIP THROUGH THE VENTILATION SYSTEM. SUPPLY WEATHER OPENINGS SHALL BE LOCATED TO PREVENT RECIRCULATION OF EXHAUST AIR WHICH MAY BE HOT OR WHICH MAY CONTAIN NOXIOUS OR TOXIC FUMES AND SMOKE. PARTICUILAR CARE SHALL BE TAKEN TO ENSURE THAT WEATHER OPENINGS ARE LOCATED CLEAR OF MISSILE AND GUN BLAST OR DESIGNED TO MEET THE SPECIFIC CRITERIA FOR THE VESSEL INVOLVED. REFER TO SHIP SPECIFICATIONS FOR REQUIREMENTS.

TERMINAL NOTES

1-T GENERAL

(A) TERMINALS WILL BE USED AS NOTED HEREIN WITH VELOCITIES COMPUTED ON A NET AREA BASIS UNLESS OTHERWISE NOTED. NET AREA REFERRED IS INLET OR OUTLET AREA WITH REDUCTION FOR WIRE MESH. (REFER TO TABLE "E", SHEET 29, FOR ALLOWABLE VELOCITIES)

(B) THE MINIMUM DESIGN QUANTITY FOR ANY TERMINAL IS 75 CFM.

(C) AN EXPANDED CONE OR RECTANGULAR TERMINAL FOR SUPPLY IS NOT REQUIRED IF THE DUCT AIR VELOCITY IS WITHIN THE RANGE SPECIFIED IN TABLE "E", SHEET 29.

(D) SUPPLY AND EXHAUST TERMINALS SHALL BE INSTALLED IN THE OVERHEAD UNLESS OTHERWISE NOTED.

(E) TERMINALS SHALL BE ARRANGED TO PREVENT WATER FROM DRIPPING, SPLASHING OR BEING BLOWN ONTO ELECTRICAL OR ELECTRONIC EQUIPMENT. WHERE ADJUSTABLE TYPE "E" TERMINALS ARE REQUIRED IN SPACES CONTAINING ELECTRONIC OR ELECTRICAL EQUIPMENT, TURBINES, GEAR OR BEARING HOUSINGS, POSITIVE, TAMPERPROOF STOPS SHALL BE PROVIDED TO PREVENT DISCHARGING AIR ACROSS EQUIPMENT. ADJUSTABILITY IN OTHER DIRECTIONS SHALL BE MAINTAINED.

(F) TERMINALS SHALL BE ARRANGED TO PREVENT SHORT CIRCUITING OF AIR BETWEEN SUPPLY AND EXHAUST TERMINALS, OR BETWEEN TERMINALS AND COMPARTMENT ACCESSES.

(G) TERMINALS SHALL BE ARRANGED TO EXHAUST HEAT OR FUMES FROM AS NEAR THE SOURCE AS POSSIBLE.

2-T SUPPLY TERMINALS - THE FOLLOWING NOTES REFLECT GUIDANCE TO TERMINAL APPLICATION AS FOUND IN THE GENERAL SPECIFICATION. HOWEVER, TYPE SELECTION MAY BE INFLUENCED BY SEVERAL FACTORS, I.E., THE SPECIFICATION OF WORK BEING PERFORMED, THE DESIRE TO MAINTAIN CONSISTENCY WITH EXISTING ENVIRONMENT, THE TYPE OF AIR HANDLED (A/C OR VENT), DESIRED PERFORMANCE, ETC.:

(A) DIFFUSING TERMINALS SHALL BE USED FOR AIR CONDITIONING SYSTEM SUPPLY. COMMERCIAL ROUND OR RECTANGULAR DIFFUSING TERMINALS SHALL BE USED IN CPO AND CREW LIVING SPACES, GALLEYS, PANTRIES, OPERATING ROOMS AND ALL SPACES IN WHICH SUSPENDED CEILINGS ARE INSTALLED. SELECTION OF TERMINALS SHALL BE BASED ON VENDOR INFORMATION. ALL OTHER AIR CONDITIONED SPACES SHALL USE NAVY STANDARD DIFFUSING TERMINALS.

(B) A COMMERCIAL GRILLE TYPE DIFFUSING TERMINAL SHALL BE UTILIZED IN THE VENTILATION SUPPLY DUCT TO EACH LAUNDRY PRESS OPERATOR'S WORKING STATION. (SEE DETAIL 29, REFERENCE 1) AN ALTERNATIVE MEANS SHALL BE PROVIDED IN THE SUPPLY DUCT UPSTREAM OF THE TERMINAL FOR DISCHARGING THE AIR INTO THE SPACE IN WHICH THE TERMINALS ARE LOCATED. THIS MAY BE ACCOMPLISHED BY PROVIDING A DAMPER CONTROLLED BRANCH, SIZED TO HANDLE THE QUANTITY OF AIR INVOLVED.

(C) TYPE "E" ADJUSTABLE BLAST TERMINALS WITHOUT DAMPERS SHALL BE USED IN VENTILATION SUPPLY TO MACHINERY SPACES, LAUNDRIES, EMERGENCY DIESEL GENERATOR ROOMS AND WORKSHOPS. THESE TERMINALS SHOULD BE INSTALLED SO THAT THERE ARE AT LEAST 3 DIAMETERS OF STRAIGHT DUCT UPSTREAM OF THE TERMINAL. TERMINALS ARE TO BE LOCATED TO DISCHARGE AT A 45 DEGREE ANGLE DOWNWARD TOWARD AND WITHIN 3 TO 5 FEET OF THE WATCHSTANDER'S TORSO.

(D) EXPANDING CONE TERMINALS, TYPE "J" (7-1/2 DEGREE SLOPE) SHALL BE UTILIZED IN VENTILATION SUPPLY TO MAGAZINES, STOREROOMS, SHAFT ALLEYS, SPACES CONTAINING HEAVIER-THAN-AIR FUMES AND REPLENISHMENT AIR TO RECIRCULATING SYSTEMS. REPLENISHMENT AIR TERMINALS SHALL BE DIRECTED INTO AND TERMINATE NOT MORE THAN 12 INCHES FROM THE AIR CONDITIONING SYSTEMS INTAKES.

2-T CONTINUED

(E) SLOTTED DUCT TERMINAL MAY BE USED FOR GALLEY SUPPLY WHERE DESIREABLE. WHERE USED, THE SLOTS SHALL BE LOCATED IN THE BOTTOM OF THE DUCT, AS NEAR THE ALLOWABLE HEADROOM LEVEL AS PRACTICAL AND APPROXIMATELY 3 TO 12 INCHES IN FRONT OF THE EQUIPMENT SERVED. (D)

(F) WIRE MESH OPENINGS MAY BE USED FOR NATURAL SUPPLY.

3-T EXHAUST TERMINALS

(A) (A) ROUND OR RECTANGULAR TERMINALS FITTED WITH PORTABLE SCREENS SHALL BE USED IN GENERAL EXCEPT WHERE HOODS ARE REQUIRED (SEE DETAIL 32, REFERENCE 1).

(B) WIRE MESH OPENINGS MAY BE USED FOR NATURAL EXHAUST.

(D) (C) IN ELECTRONICS SPACES, EXHAUST TERMINALS SHALL BE LOCATED WITHIN 6 INCHES OF THE DISCHARGE OUTLET OF EQUIPMENT PROVIDED WITH INTERNAL VENTILATION BLOWERS. THE TERMINAL SHALL NOT BE DIRECTLY CONNECTED TO THE INTERNAL VENTILATION OF THE EQUIPMENT.

(D) IN COMPARTMENTS FITTED WITH CARBON DIOXIDE SMOTHERING OR COMPARTMENTS SUBJECT TO CONTAMINATION BY HEAVIER-THAN-AIR VAPORS, EXHAUST TERMINALS SHALL BE INSTALLED 9 INCHES ABOVE THE DECK.

(E) EXHAUST TERMINALS IN SPACES CONTAINING HYDRAULIC OIL RESERVOIRS SHALL BE LOCATED CLOSE TO THE RESERVOIR BREATHER PIPE.

(F) EXHAUST HOODS SHALL BE PROVIDED OVER FORGES, STEAM TABLES, SIZE 50 DA AND SMALLER DISHWASHING MACHINES, THE FEED AND DISCHARGE ENDS OF SIZE 60 DA AND LARGER DISHWASHING MACHINES, CLEANING TANKS WHERE EXCESSIVE AMOUNTS OF TOXIC VAPORS PERSIST DURING CLEANING PROCESS, AND SHOP EQUIPMENTS EMITTING EXCESSIVE AMOUNTS OF HEAT, FUMES OR TOXIC VAPORS. EXHAUST FUME COLLECTORS SHALL BE INSTALLED OVER WELDING SLABS AND WELDING TABLES. REFER TO "INDUSTRIAL VENTILATION - A MANUAL OF RECOMMENDED PRACTICE" FOR GUIDANCE IN THE DESIGN AND SELECTION OF ACCEPTABLE EXHAUST HOODS.

(D) (G) A VENTILATION GREASE INTERCEPTOR HOOD OF THE TYPE INDICATED ON DRAWING NAVSHIPS NO. 805-1749099, SHALL BE INSTALLED OVER EACH STEAM KETTLE, ROAST OVEN, CONVECTION OVEN, BAKE OVEN, GRIDDLE, FRY KETTLE, DEEP FAT FRYER, DOUGH-NUT FRYER AND RANGE. A SIMILAR HOOD SHALL BE INSTALLED IN THE FILTER CLEANING SHOP. (FOR DETAIL REQUIREMENTS, REFER TO GENERAL SPECIFICATIONS).

(H) A SPRING LOADED FIRE DAMPER, WITH DAMPER HOLDING SOLENOID TIED INTO THE INTERCEPTOR HOOD CONTROL SYSTEM, SHALL BE INSTALLED IN ALL AUXILIARY GALLEY EXHAUST TERMINALS AND CONVENTIONAL CANOPY HOODS.

STRUCTURAL NOTES

1-S STRUCTURAL CUTS SHALL BE MADE AND COAMINGS INSTALLED FROM LOCATIONS GIVEN ON VENTILATION ARRANGEMENT DRAWINGS.

2-S DOUBLER PLATES, IF REQUIRED, SHALL BE DETAILED ON THE VENTILATION ARRANGEMENT PLAN UNLESS OTHERWISE NOTED BY REFERENCE TO STRUCTURAL DETAILS.

3-S COAMINGS FOR DUCT PENETRATIONS IN STRUCTURE SHALL BE OF THE THICKNESS AND MATERIAL NOTED ON THE ARRANGEMENT DRAWINGS. COAMINGS SHALL BE IN ACCORDANCE WITH DETAIL 18 THRU 25 ON REFERENCE 1.

4-S COAMINGS 3/16" THICK AND LESS, PENETRATING LIGHT BULKHEADS OR DECKS (10.2 LB STL/ 1/4" THICK AL OR LESS) ARE TO BE WELDED ON ONE SIDE OF THE PENETRATION ONLY WITH A CONTINUOUS 1/8" AIRTIGHT FILLET WELD. THE OTHER SIDE OF THE PENETRATION IS TO BE CAULKED IF NECESSARY FOR APPEARANCE IN MANNED SPACES. COAMINGS 3/16" THICK PENETRATING DECKS OR BULKHEADS THICKER THAN 1/4 INCH ARE CONSIDERED NON-COMPENSATING AND SHALL BE WELDED WITH A 1/8" DOUBLE FILLET WELD. COAMINGS HAVING THICKNESS GREATER THAN 3/16" ARE CONSIDERED STRUCTURAL REINFORCEMENTS AND ARE TO BE WELDED AND INSPECTED IN ACCORDANCE WITH TABLES "A", "B", "C" AND "D" AND THE FOLLOWING NOTES:

(C) (A) WELDING SHALL BE AS SPECIFIED ON THIS DRAWING AND IN ACCORDANCE WITH MIL-STD-1689A.

(B) ALL FULL PENETRATION WELDS (BUTT, CORNER OR TEE JOINTS) IN OR TO HY-80/100 MATERIAL SHALL BE MT INSPECTED (100% BACKGOUGE AND FINAL WELD)

(C) WELD SIZE IS BASED ON THICKNESS OF WEAKER MEMBER.

5-S AFTER TACKING COAMINGS IN PLACE, INSTALL A TEMPORARY COVER WHERE NECESSARY TO PREVENT DEBRIS FROM ENTERING DUCTWORK.

6-S HY-80/100 COAMINGS WHICH ARE COLD FORMED AND HAVE BEEN ELONGATED IN EXCESS OF 12 PERCENT SHALL BE MT INSPECTED. THE FOLLOWING TABLE GIVES THE MINIMUM INSIDE DIAMETER TO PREVENT AN ELONGATION GREATER THAN 12%.

PLATE THICKNESS (IN INCHES)	INSIDE DIAMETER (IN INCHES)
.50	4
.625	4-5/8
.75	5-1/2
.875	6-1/2
1.0	7-1/4
1.125	8-1/4
1.25	9-1/8
1.375	10-1/8
1.5	11
1.625	11-7/8
1.75	12-7/8
1.875	13-3/4
2.0	14-3/4

SIZE	FSCM NO.	WT GRP	NAVSEA DWG NO.	REV
A	53711	501	4870232	D
SCALE: N/A			SHEET 19	

TABLE "A"

WELDS ATTACHING COAMING TO: BALLISTIC PLATING AND OR ATTACHED FRAMING, SHELL PLATING AND/OR ATTACHED FRAMING, STRINGER STRAKES AND OR ATTACHED FRAMING IN THE CORRESPONDING STRENGTH DECK.

THICKNESS OF WEAKER MEMBER		WELD SIZE FOR COAMING MATERIAL				
AL	STL	OSS	HSS	HY-80	HY-100	5456 AL
.250	10.2 LB	3/16	1/4	1/4	5/16	1/4
.3125	12.75 LB	1/4	5/16	5/16	3/8	1/4
.375	15.3 LB	5/16	3/8	3/8	7/16	5/16
.4375	17.85 LB	3/8	7/16	7/16	1/2	3/8
.50	20.4 LB	3/8	7/16	1/2	9/16	7/16
.625	25.5 LB	1/2	9/16	5/8	T2V.1*	1/2
.750	30.6 LB	9/16	T2V.1	T2V.1*	T2V.1*	5/8
.875	35.7 LB	T2V.2	T2V.2	T2V.2*	T2V.2*	T2V.2
1.0	40.8 LB	T2V.2	T2V.2	T2V.2*	T2V.2*	T2V.2
OVER 1.0	OVER 40.8 LB	T2V.2	T2V.2	T2V.2*	T2V.2*	T2V.2

* SEE NOTE 4-S(B)

TABLE "B"

WELDS ATTACHING COAMING TO BULKHEADS, DECKS, FLOORS AND/OR ATTACHED FRAMING, WHEN W.T., O.T. OR CONTINUOUS STRUCTURE.

THICKNESS OF WEAKER MEMBER		WELD SIZE FOR COAMING MATERIAL				
AL	STL	OSS	HSS	HY-80	HY-100	5456 AL
.250	10.2 LB	3/16	3/16	3/16	1/4	1/4
.3125	12.75 LB	3/16	1/4	1/4	5/16	1/4
.375	15.3 LB	1/4	1/4	5/16	5/16	5/16
.4375	17.85 LB	1/4	5/16	5/16	3/8	3/8
.50	20.4 LB	5/16	3/8	3/8	7/16	7/16
.625	25.5 LB	3/8	7/16	1/2	9/16	1/2
.750	30.6 LB	7/16	1/2	9/16	5/8	5/8
.875	35.7 LB	1/2	5/8	5/8	T2V.2*	T2V.2
1.0	40.8 LB	9/16	T2V.2	T2V.2*	T2V.2*	T2V.2
OVER 1.0	OVER 40.8 LB	T2V.2	T2V.2	T2V.2*	T2V.2*	T2V.2

* SEE NOTE 4-S(B)

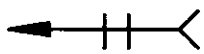
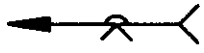
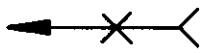
TABLE "C"

WELDS ATTACHING COAMING TO BULKHEADS, DECKS, FLOORS AND/OR ATTACHED FRAMING, WHEN N.T. OR INTERCOSTAL STRUCTURE.

THICKNESS OF WEAKER MEMBER		WELD SIZE FOR COAMING MATERIAL				
AL	STL	OSS	HSS	HY-80	HY-100	5456 AL
.250	10.2 LB	1/8	1/8	1/8	3/16	3/16
.3125	12.75 LB	1/8	3/16	3/16	3/16	1/4
.375	15.3 LB	3/16	3/16	3/16	1/4	5/16
.4375	17.85 LB	3/16	1/4	1/4	1/4	3/8
.50	20.4 LB	3/16	1/4	1/4	5/16	7/16
.625	25.5 LB	1/4	5/16	5/16	3/8	1/2
.750	30.6 LB	5/16	3/8	3/8	7/16	5/8
.875	35.7 LB	3/8	7/16	7/16	1/2	T2V.2
1.0	40.8 LB	3/8	7/16	1/2	9/16	T2V.2

TABLE "D"

WELDS IN COAMINGS

MATERIAL THICKNESS		WELD JOINT DESIGN		
AL	STL			
.250	10.2 LB & LESS		B2S.1*	
OVER .250 TO 1.0	OVER 10.2 LB TO 40.8 LB		B2V.1* **	
OVER 1.0	OVER 40.8 LB		B2V.3*	MODIFIED: 2/3 T BEV 1/2 T BACKGOUGE

* SEE NOTE 4-S(B)

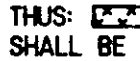
** BEVEL SHALL BE TO THE INSIDE OF PLATING WHEN POSSIBLE

SIZE	FSCM NO.	WT GRP	NAVSEA DWG NO.	REV
A	53711	501	4870232	D
SCALE: N/A			SHEET 21	

INSULATION NOTES

1-L AFTER PAINTING, REQUIRED BY NOTE 41-C, IS ACCOMPLISHED, VENTILATION AND AIR CONDITIONING DUCTS, TRUNKS AND EQUIPMENT INCLUDING THEIR FLANGES WILL REQUIRE:

(A) THERMAL INSULATION WHEN SHOWN THUS:  OR THUS  , IS 1 INCH THICK UNLESS OTHERWISE NOTES ON THE VENTILATION ARRANGEMENT DRAWINGS.

(B) ANTI-SWEAT PAINT, FED. SPEC. TT-C-492, APPLIED TO AIR CONDITIONING DUCTWORK WHEN SHOWN THUS:  OR THUS:  ON VENTILATION ARRANGEMENT DRAWINGS APPLICATION SHALL BE BY SPRAYING OR BRUSHING TO A THICKNESS OF 1/16 OR 1/8 INCH AS INDICATED THEREON. FOLLOWING THE APPLICATION, THE SURFACE SHALL BE ADEQUATELY STENCILLED "DO NOT PAINT" TO PREVENT AN OVERCOATING WHICH MAY DESTROY THE EFFECTIVENESS OF THE ANTI-SWEAT COATING.

(D) (C) ENSURE GRAVITY COIL(S) HAVE AN ANTI-SWEAT COATING ON THE UNDER SURFACE OF DRAIN "Z" BARS AND REMOVABLE DRAIN TROUGHS. IF THESE COIL(S) HAVE NOT BEEN COATED IT WILL BE NECESSARY TO PROVIDE MATERIAL AND APPLY AS FOLLOWS:
TO THE CLEAN DRY SURFACE OF THE GRAVITY COIL'S CONDENSATE "Z" BAR & TROUGH APPLY A BRUSH COATING OF BINDER, FORMULA 34, 5 MILS THICK. APPLY A BRUSH COATING OF VERMICULITE (ASTM-C516) TO THE BINDER COATING. NO PART OF THE COIL OR FINS ARE TO BE COATED. TEMPORARILY REMOVE TROUGH, APPLY ANTISWEAT, AND REINSTALL. NAVSHIPS TECH MANUAL S9086-VD-STM-000 CHAPTER 631 & S9086-VH-STM-010 CHAPTER 635 COVER THIS APPLICATION.

2-L WHERE BOTH THERMAL INSULATION AND ACOUSTIC ABSORPTIVE TREATMENT ARE NECESSARY, ACOUSTIC ABSORPTIVE TREATMENT ONLY SHALL BE INSTALLED.

3-L THERMAL INSULATION SHALL BE APPLIED IN THE FOLLOWING LOCATIONS:

(A) ON PARTS OF SUPPLY SYSTEM DUCTS CARRYING UNHEATED AIR THAT PASS THROUGH NORMALLY HEATED SPACES AND ON ALL SUPPLY DUCTS THAT PASS THROUGH OR TERMINATE IN HEAT PRODUCING SPACES.

(B) ON DUCTS ON THE HOT SIDE OF REHEATERS PASSING THROUGH COMPARTMENTS WHERE TEMPERATURE DIFFERENCES BETWEEN COMPARTMENT AND DUCT AIR MAY BE GREATER THAN 25 DEGREES FAHRENHEIT.

(C) ON EXHAUST DUCTS FROM HEAT PRODUCING SPACES PASSING THROUGH SPACES OTHER THAN HEAT PRODUCING AND UPTAKE SPACES.

(D) ON AIR CONDITIONING DUCTS WHERE SPACE DEWPOINT IS MORE THAN 4 DEGREES FAHRENHEIT ABOVE THE DUCT DRY BULB TEMPERATURE.

(E) ON AIR CONDITIONING DUCTWORK FROM THE COOLING COIL TO THE FAN, AS A MINIMUM, OR IF THE FAN IS UPSTREAM OF THE COOLING COIL, FROM THE COIL DISCHARGE TO A POINT 5 TIMES THE EQUIVALENT DIAMETER OF THE MAIN DUCT DOWNSTREAM OF THE BY-PASS BRANCH.

(F) ON DUCTS IN WAY OF BERTHS IF THE TEMPERATURE IN THE DUCT IS HIGHER THAN 90 DEGREES FAHRENHEIT.

(G) ON DUCT HEATERS WHERE PROTECTION OF PERSONNEL IS INVOLVED.

(H) ON COOLING COILS.

4-L WHEN THERMAL INSULATION IS CALLED FOR ON THE VENTILATION ARRANGEMENT DRAWINGS THE FOLLOWING MATERIALS SHALL BE USED:

(D) (A) FOR ROUND DUCTS, 1" FIBROUS GLASS BLANKET, MIL. SPEC. MIL-I-22023, TYPE I, CL5 (LAGGED) OR 1" FIBROUS GLASS COVERING MIL-I-22344.

(D) (B) FOR RECTANGULAR AND FLAT-OVAL DUCTS, 1" FIBROUS GLASS BLANKET, MIL. SPEC. MIL-I-22023, TYPE I, CL. 5 LAGGED OR 1" FIBROUS GLASS HARD SURFACE BOARD MIL. SPEC. MIL-I-742, TYPE I (NOT LAGGED) OR TYPE II (UNFACED BOARD), (LAGGED), TYPE I (NOT LAGGED) GLASS BOARD INSULATION IS RECOMMENDED FOR USE ON FLAT SURFACES 9 INCHES OR GREATER IN WIDTH & ON HEATERS.

(C) FOSTER 30-36 OR EQUAL ADHESIVE SHALL BE USED AS NECESSARY FOR APPLYING INSULATION AND LAGGING AND FOR SEALING OUTER SURFACE OF INSTALLATION PRIOR TO FINAL PAINTING.

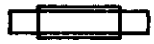
(D) (D) FIBROUS GLASS CLOTH, MIL. SPEC. MIL-C-20079 TYPE I SHALL BE APPLIED AS A COVERING FOR THE INSULATION BLANKET OR UNFACED, TYPE II TYPE BOARD.

(E) FOR FLANGES, FIBROUS GLASS BLANKET SHALL BE WRAPPED WITH FIBROUS GLASS CLOTH, FORMING A PAD APPROXIMATELY 6 INCHES WIDE WHICH MAY BE SECURELY WIRED TO PREVENT SAGGING. SEE DETAIL 51, REFERENCE 1.

5-L A VAPOR BARRIER CONSISTING OF THREE COATS OF COATING COMPOUND MIL-C-19993, SHALL BE APPLIED TO ALL THERMALLY INSULATED DUCTS IN AIR CONDITIONING SYSTEMS AND TO THOSE VENTILATION DUCTS WHICH ARE INSULATED TO PREVENT SURFACE CONDENSATION. INSULATION SURFACE WILL HAVE FINAL PAINTING AS REQUIRED TO MATCH SURROUNDING SURFACES.

6-L WHERE NECESSARY, THE THERMAL INSULATION FOR VENTILATION DUCTS MAY BE REDUCED TO NOT LESS THAN 1/4" THICKNESS IN WAY OF STRUCTURE, EQUIPMENT, DUCTS, PIPE, ETC.

7-L INSULATION ON DUCTS SUBJECT TO DAMAGE IS TO BE PROTECTED BY 22 USSG CRES SHEATHING, FED. SPEC. QQ-S-766, CLASS 430-2B FINISH. SHEATHING SHALL BE INSTALLED WHERE NECESSARY TO PROTECT INSULATION FROM DAMAGE AND ALWAYS ON INSULATED DUCTS THAT ARE ADJACENT TO LAVATORIES, SERVICE SINKS, WATERCLOSETS, OVENS, RANGES, DISHWASHING MACHINES AND FOOD PREPARATION TABLES. THE SHEATHING SHALL EXTEND FROM THE DECK TO AT LEAST TWO FEET IN ALL DIRECTIONS BEYOND THE WORKING SURFACE OF THE FIXTURE.

8-L VENTILATION OR AIR CONDITIONING DUCTS AND TRUNKS INDICATED THUS:  ARE TO BE ACOUSTICALLY TREATED INTERNALLY IN ACCORDANCE WITH DETAILS 52 (TYPE "A-1" AND "A-2"), AND 53 (TYPE "K-1" AND "K-2") AS CALLED FOR AN ARRANGEMENT DRAWING. DUCT SIZES GIVEN ON VENTILATION ARRANGEMENT DRAWINGS RELATE TO THE STEEL OR ALUMINUM DUCT WALL FOR THE INTERNALLY SOUND INSULATED DUCTWORK. ALL ACOUSTIC INSULATION SHALL BE FIBROUS GLASS FELT, MIL. SPEC. MIL-I-22023 TYPE II, CL. 3, SHEATHED WITH ALUMINUM ALLOY, FED. SPEC. QQ-A-250/8, .040 THICK WITH 3/16 INCH DIAMETER HOLES ON 3/8 INCH CENTERS, STAGGERED.

9-L THERMAL INSULATION WILL BE INSTALLED ON WATERTIGHT DUCTWORK, OUTSIDE OF THE COMPARTMENT SERVED, ONLY AFTER SPECIFIED COMPARTMENT PRESSURE TESTS HAVE BEEN COMPLETED. WHERE THIS IS NOT PRACTICABLE BECAUSE OF LOCAL CONDITIONS, DUCTWORK MAY BE INSULATED PRIOR TO COMPARTMENT TESTING ONLY AFTER DUCT HAS BEEN TESTED TO INSURE REQUIRED TIGHTNESS PRIOR TO INSTALLATION.

10-L WHEN THERMALLY INSULATED DIVISION PLATES ARE INDICATED ON VENTILATION ARRANGEMENT DRAWINGS, 1" THICK FIBROUS GLASS BLANKET MIL-I-22023 TYPE I, CL 5 SHALL BE APPLIED AND SHEATHED WITH .040 THICK ALUMINUM OR 20 USSG GALVANIZED STEEL AS APPLICABLE. SHEATHING TO BE INSTALLED IN A MANNER TO ELIMINATE VIBRATION. ALL SEAMS IN SHEATHING SHALL BE LAPPED IN THE DIRECTION OF AIR FLOW.

11-L WHERE PLENUM CHAMBERS ARE REQUIRED TO BE ACOUSTICALLY TREATED, INSULATION MATERIAL SHALL BE FIBROUS GLASS FELT, MIL. SPEC. MIL-I-22023, TYPE II, CL 3, SHEATHED WITH ALUMINUM ALLOY, FED. SPEC. QQ-A-250/8, .040" THICK WITH 3/16 INCH DIAMETER HOLES ON 3/8 INCH CENTERS, STAGGERED. AS AN ALTERNATE, WHERE PLENUM ACOUSTIC TREATMENT IS NOT SUSCEPTIBLE TO DAMAGE RESULTING FROM PERSONNEL ACCESS, INSULATION MATERIAL MAY BE FIBROUS GLASS ACOUSTICAL ABSORPTIVE BOARD, MIL. SPEC. MIL-A-23054, INSTALLED IN ACCORDANCE WITH 805-2483105. PERFORATED ACOUSTIC TREATMENT SHALL NOT BE APPLIED TO INTERNAL SURFACES OF PLENUM CHAMBERS INTO WHICH MACHINERY SPACE EXHAUST SYSTEMS DISCHARGE.

INSTALLATION NOTES

1-1 WHERE CLEARANCE CUTS FOR DUCT PENETRATIONS THRU JOINER AND NON-TIGHT BULKHEADS EXCEEDS 1/2 INCH PER SIDE AND WHERE RATPROOF OR FUMETIGHT INTEGRITY MUST BE MAINTAINED, COLLARS SHALL BE INSTALLED IN ACCORDANCE WITH WATERFRONT PRACTICES.

2-1 A CLEAR HEADROOM UNDER THE FLANGE OF DUCTS AND BRANCHES OF AT LEAST 6'-5" IS REQUIRED IN ALL AREAS, UNLESS OTHERWISE NOTED ON THE ARRANGEMENT PLANS. WHERE UNAVOIDABLE AND WHERE A FLAT FLANGE CANNOT BE USED, FLANGES AND FLANGE CORNERS PROTRUDING BELOW THE MINIMUM HEADROOM LEVEL SHALL BE PADDED TO PREVENT INJURY TO PERSONNEL. FLAT FLANGE CONNECTIONS, DETAIL 9, REFERENCE 1, ARE TO BE KEPT TO A MINIMUM.

3-1 ORIFICE PLATES, FOR BALANCING, SHALL BE PROVIDED IN MAINS, SUBMAINS AND BRANCHES OF SYSTEMS SERVING VENTILATED AND AIR CONDITIONED SPACES AS REQUIRED EITHER (A) BY CALCULATED BALANCE DURING DESIGN OR AT INSTALLATION BASED ON SYSTEM DELIVERY. SEE PARAGRAPH 095-512, REFERENCE 31, FOR AIR DELIVERY ALLOWANCES.

(D) 4-1 WHERE NECESSARY FOR DRAINAGE AND TO SUIT WORK ON SHIP, DUCTS, TRUNKS AND PLENUMS SHALL BE FITTED WITH DRAINS AT LOW POINTS IN ACCORDANCE WITH PREFERED DETAILS 74, 75 & 76 AND ALTERNATE DETAILS 40 & 41 ON REFERENCE 1.

(D) 5-1 NAVY STANDARD TYPE I FILTER GAGES SHALL BE INSTALLED FOR AIR FILTERS IN SYSTEMS PROVIDING COOLING FOR VITAL CONTROL AND ELECTRONIC SPACES. SEE ALTERNATE DETAIL 56 & 58 REFERENCE 1. FOR PREFERRED METHOD, SEE DETAILS 91 THRU 96, REFERENCE 1.

(D) 6-1 NAVY STANDARD TYPE II OR III FILTER GAGES SHALL BE INSTALLED FOR ALL HIGH EFFICIENCY AND ABSOLUTE FILTERS AND FOR FLAME ARRESTERS AND THIER FILTERS. SEE ALTERNATE DETAIL 57 & 58, REFERENCE 1. FOR PREFERRED METHOD, SEE DETAILS 91 THROUGH 96, REFERENCE 1.

7-1 TO ENSURE THE PROPER OPERATION OF THE FILTER GAGES AND TO PREVENT THE ACCUMULATION OF DIRT AND DEBRIS ON FLAME ARRESTERS AND FILTER MEDIA DURING THE CONSTRUCTION PERIOD, THE FOLLOWING PRECAUTIONS SHALL BE TAKEN:

(A) FILTER GAGES, FLAME ARRESTERS AND FILTER MEDIA SHALL BE INSTALLED ONLY AFTER THE SPACES SERVED HAVE BEEN THOROUGHLY CLEANED PRIOR TO TESTING.

(B) OPENINGS IN A SYSTEM SHALL BE BLANKED OFF PROGRESSIVELY AS THE SYSTEM IS INSTALLED.

(C) MOCK UPS OF FLAME ARRESTERS MAY BE PROVIDED WHERE NECESSARY TO PROVIDE DUCT CONTINUITY PRIOR TO INSTALLATION OF FLAME ARRESTERS AS NOTED ABOVE.

(D) SYSTEMS WITH FLAME ARRESTERS AND FILTER MEDIA INSTALLED SHOULD NOT BE USED FOR VENTILATION WHILE SHIP IS IN OVERHAUL, UNLESS THAT PORTION OF SHIP BEING SERVED BY THE VENT SYSTEM IS NOT AFFECTED BY THE OVERHAUL. PORTABLE BLOWERS SHOULD BE USED FOR THIS PURPOSE WHERE NECESSARY.

8-1 CARE SHALL BE TAKEN WHEN INSTALLING GASKETS THAT THEY DO NOT EXTEND INTO THE AIR STREAM DUE TO IMPROPER ALIGNMENT. GASKETS SHALL BE INSTALLED IN ACCORDANCE WITH TABLE "A" AS REQUIRED BY BUSHIPS DWG. B-153, AS REVISED. THE USE OF "WOOL FELT IMPREGNATED" MIL-G-20241 IS PROHIBITED.

TABLE "A"
GASKET MATERIALS

USE	STYLE	SPEC	NSN
DUCT HTR FLANGES STEAM/ELEC	RUBBER SILICONE .120" THK GR 50 CL 2B	FED SPEC ZZ-R-765	9G9320-00 -104-9032
FLANGES, WTRTT & NWT DUCTWORK	RUBBER CLOTH INSERTED .105" THK CLASS 4 OR RUBBER SHEET 1/8" THK 45 DUROMETER HARDNESS	FED SPEC HH-P-151 MIL-R-900	9Z5330-00 -179-0052 9Z5330-01 -119-5460
ACCESS PLATES	RUBBER SHEET 1/8" THK 45 DUROMETER HARDNESS OR RUBBER SILICONE .120 THK	FED SPEC MIL-R-900 ZZ-R-765	9Z5330-01 -119-5460 9G9320-00 -104-9032
CLOSURES, ALL EXCEPT TYPE R & K BUTTERFLY VALVES	RUBBER SHEET 1/8" THK 45 DUROMETER HARDNESS	MIL-R-900	9Z5330-01 -119-5460

-WHEN IN DOUBT ABOUT THE TYPE OF FLANGE OR ACCESS PLATE ASSUME THAT IT IS WTRTT.
-STEEL R & K BUTTTERFLY VALVES ARE FURNISHED WITH SEALS INSTALLED.

9-1 SPECIAL CARE SHALL BE TAKEN WHEN INSTALLING TERMINALS TO PREVENT WATER FROM DRIPPING, SPLASHING OR BEING BLOWN INTO OR ON ELECTRONIC OR ELECTRICAL EQUIPMENT TAMPER-PROOF STOPS SHALL BE PROVIDED ON ADJUSTABLE BLAST TERMINALS WHERE NECESSARY TO PREVENT AIR FROM BEING DISCHARGED ACROSS THE EQUIPMENT.

10-1 HANGERS FOR SUPPORTING DUCTWORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH DETAILS 15, 16 AND 17 OF REFERENCE 1, AND ARE TO BE LOCATED AND INSTALLED BY THE INSTALLATION PERSONNEL AS FOLLOWS:

(A) LOCATION AND SPACING SHALL BE AT THE DISCRETION OF THE INSTALLATION PERSONNEL, EXCEPT THAT HANGER SPACING FOR GRADE "A" SHOCK DUCTWORK SHALL NOT EXCEED 7 FEET AND IF DUCTS ARE LARGE (THIRTY OR GREATER IN WIDTH OR DEPTH), SPACING SHALL BE REDUCED TO APPROXIMATELY 4 FEET.

(B) DUCTS, CLASSIFIED AS GRADE "A" SHOCK PASSING THROUGH CLEARANCE CUTS IN NON-TIGHT AND JOINER BULKHEADS, MUST BE SUPPORTED BY A HANGER PLACED NOT GREATER THAN 6" FROM THE BULKHEAD.

(C) DAMPERS, TERMINALS AND OTHER COMPONENTS NOT SUPPORTED BY A FOUNDATION SHALL BE SUPPORTED WITH AT LEAST ONE HANGER AND IT SHALL BE LOCATED WITHIN 12 INCHES OF THE COMPONENT.

(D) HANGERS SHOULD BE ATTACHED AS NEAR AS POSSIBLE TO DIVISION JOINTS.

(E) WHERE GRADE "A" DUCTS ARE LOCATED WITHIN 2 INCHES OF EQUIPMENT AND OR STRUCTURE AND WHEN IMPACTING WITH THE EQUIPMENT OR STRUCTURE RESULT IN "POINT CONTACT", AN ADDITIONAL HANGER TO PREVENT IMPACT SHALL BE INSTALLED.

10-1 CONTINUED

(F) HANGERS SHOULD BE ATTACHED TO STRUCTURAL FRAMING AND STIFFENERS IN LIEU OF PLATING WHENEVER POSSIBLE. DUCT DESIGNED TO MEET THE REQUIREMENTS OF GRADE "A" SHOCK SHALL BE ATTACHED TO FRAMING IN LIEU OF PLATING OF WEATHER BOUNDARIES SUBJECTED TO THE FORCE OF LOADS SUCH AS GUN AND/OR MISSILE BLAST AND AIRCRAFT LANDING.

(G) HANGER LOCATION FOR VERTICAL DUCTS ARE TO BE AT THE DUCT MIDPOINT BETWEEN DECKS.

11-1 BOLTING:

(A) MALE THREADS ON THREADED FASTENERS, WHEN INSTALLED AND TIGHTENED, SHALL PROTRUDE AT LEAST ONE THREAD BEYOND THE TOP OF THE NUT OR PLASTIC INSERT & SHALL NOT PROTRUDE MORE THAN FIVE THREADS.

(B) WASHERS:

(1) SHALL NOT BE USED TO LESSEN THREAD PROTRUSION.

(2) SHALL NOT BE USED TO LOCK THREADED FASTENERS EXCEPT THAT THE CENTER BOLT OF ISOLATORS ON FAN FOUNDATION SHALL BE LOCKED IN PLACE WITH A LOCK WASHER.

(3) FLAT WASHERS OF THE SAME MATERIAL AND COATING AS THE BOLTS AND NUTS SHALL BE FITTED BELOW ALL NUT AND BOLT HEADS WHICH ADJOIN ALUMINUM OR ALUMINUM ALLOYS.

(D) (C) WHEN ATTACHING EQUIPMENT FOR SHOCK GRADES "A", "B", "C" TO FOUNDATIONS USE ZINC PLATED STEEL BOLTS, GRADE 5, TO SPECIFICATION MIL-S-1222. ZINC PLATED STEEL NUTS SHALL BE SELF LOCKING TO SPEC. MS-17829.

(D) (D) FOR GENERAL USE, EXCEPT AS NOTED ON REFERENCE 1, ALL SHOCK GRADES USE:

(1) ZINC PLATES NUTS AND BOLTS TO SPECIFICATION MIL-S-1222.

(2) ZINC PLATED MACHINE SCREWS TO SPECIFICATION FF-S-92.

12-1 THE OPEN HEADER END OF SIZES 47DW AND 48DW COOLING COILS SHALL BE ENCLOSED WITH A 16 USSG GALVANIZED SHEET METAL COVER WHEN INSTALLED ON SHIP TO FORM A SURFACE FOR THERMAL INSULATION.

13-1 AIR FLOW DIRECTION ARROW ON THE BOTTOM OF EACH COOLING COIL DRAIN PAN SHALL BE ALIGNED WITH THE DIRECTION OF AIR FLOW. THE DRAIN PAN MAY BE ROTATED 180 DEGREES TO ACCOMPLISHED THIS REQUIREMENT.

14-1 ON 50 SERIES COOLING COILS THE DRAIN PAN MUST ALWAYS BE INSTALLED SO THAT THE SLOTTED OPENING ALLOWING CONDENSATE PASSAGE INTO THE PAN IS ON THE LEAVING AIR SIDE.

15-1 FAYING SURFACES OF ALUMINUM IN CONTACT WITH ALUMINUM AND EXPOSED TO THE WEATHER SHALL BE COATED WITH ONE COAT OF ZINC CHROMATE PRIMER FORMULA 84, EXCEPT IN WAY OF WELDING.

16-1 WHERE ALUMINUM WILL BE JOINED TO OTHER METALS INCLUDING GALVANIZED STEEL, OR TO WOOD, EACH METAL FAYING SURFACE SHALL BE PROTECTED WITH TWO COATS OF FORMULA 84 OVER ONE COAT OF FORMULA 117. IN ADDITION, WHERE SUCH JOINTS ARE EXPOSED TO THE WEATHER, SEA WATER OR WET SPACES, INSULATION TAPE, MINIMUM THICKNESS 20 MILS, TO MIL. SPEC. MIL-I-24391, SHALL BE INSTALLED BETWEEN THE FAYING SURFACES AND SHALL EXTEND BEYOND THE EDGE OF THE JOINT.

17-1 NON-WELDED FAYING SURFACES OF STEEL DUCT JOINTS SHALL RECIEVE TWO COATS OF PRIMER, FORMULA 150, ON EACH SURFACE, IN ADDITION TO GASKETS.

18-1 FLAT BAR TAPPING RING OR ELBOW TO BE WELDED TO GREASE INTERCEPTOR HOOD, AT SHIP INSTALLATION, BEFORE HOOD IS INSTALLED. SEE DETAIL 35, REFERENCE 1.

19-1 BOLTS FOR HOLDING DOWN GRADE A & B SHOCK EQUIPMENT TO THIER FOUNDATIONS OR SUB-BASES SHALL BE INSTALLED IN HOLES NO GREATER THAN THE FOLLOWING SIZES UNLESS OTHERWISE INDICATED ON FOUNDATION DETAIL PLANS:

NOMINAL BOLT DIAMETER (INCHES)	MAXIMUN DIAMETER OF HOLE (INCHES)
3/4 AND SMALLER	NOMINAL BOLT DIAMETER +1/32
LARGER THAN 3/4	NOMINAL BOLT DIAMETER +1/16

THESE CLEARANCES APPLY TO CLEARANCE HOLES ONLY. WHERE ALIGNMENT MUST BE MAINTAINED, FITTED BOLTS OR OTHER POSITIVE METHODS SHOULD BE USED

20-1 THE RUBBER RESILIENT ELEMENT OF ISOLATORS SHALL NOT BE PAINTED. THE DATE (MONTH AND YEAR) ON WHICH THE RESILIENT MOUNTS ARE LOADED BY THE UNITS THEY SUPPORT SHALL EITHER BE STENCILLED ON METAL PARTS OF THE MOUNT ADJACENT TO THE MOUNT IDENTIFICATION DATA OR STAMPED ON METAL TAGS (I.E. CABLE-RIBBON) AND ATTACHED TO THE MOUNT ADJACENT TO THE IDENTIFICATION DATA AND SHALL BE VISIBLE AFTER INSTALLATION WITHOUT REMOVAL OF THE MOUNT FROM THE INSTALLED POSITION.

21-1 FLEXIBLE CONNECTIONS, REQUIRED AT THE ENDS OF RESILIENTLY MOUNTED FANS, SHALL BE SLIGHTLY COMPRESSED WHEN INSTALLED TO ALLOW FOR ISOLATOR MOVEMENT. FLEXIBLE CONNECTIONS SHALL NOT BE PAINTED.

22-1 TYPE "E" TERMINALS IN MACHINERY SPACES ARE TO BE DIRECTED AT AND LOCATED WITHIN 3 TO 5 FEET OF THE WATCHSTANDERS OR OPERATORS TORSO.

23-1 MINOR ADJUSTMENTS IN VENTILATION LOCATIONS MAY BE ACCOMPLISHED ON SHIP TO CLEAR OBSTRUCTIONS WITHOUT DRAWING CHANGE UPON AUTHORIZATION BY DESIGN REPRESENTATIVE.

24-1 TEMPORARY PROTECTIVE COVERING SHALL BE PROVIDED ON OPEN FACES OF COOLING COILS, HEATERS AND ELECTROSTATIC PRECIPITATORS DURING INSTALLATION.

25-1 WHERE TEMPORARY OPENINGS IN DUCTWORK ARE NECESSARY TO FACILITATE INSTALLATION, CARE SHALL BE EXERCISED THAT THE SYSTEM TIGHTNESS INTEGRITY IS RESTORED UPON COMPLETION.

26-1 FLEXIBLE NON-METALLIC DUCT MAY BE USED FOR ELBOWS OR OFFSETS IN ROUND NWT DUCT, SIZES 8 INCHES AND BELOW, WHERE CONDITIONS WOULD NOT PERMIT INSTALLATION OF RIGID DUCT ELBOWS. USE OF FLEXIBLE DUCT FOR THIS PURPOSE SHALL BE HELD TO A MINIMUM AND WHERE USED, ATTACHMENTS SHALL BE IN ACCORDANCE WITH DETAIL 12, REFERENCE 1.

(D)

TABLE "E"

FEATURE	VELOCITIES (F.P.M.) MAXIMUM	MINIMUM
ADJUSTABLE BLAST TERMINALS, MACHINERY SPACES	3,500	2,500
ADJUSTABLE BLAST TERMINALS, VENTILATED SPACES	2,500	1,500
AIR FILTERS, FACE VELOCITY (NAVY STANDARD)	900	375
AIR FILTERS, HEPA AND ABSOLUTE, FACE VELOCITY	300	200
COOLING COILS, SIZES 51-53, FACE VELOCITY	600	300
COOLING COILS, SIZE 54, FACE VELOCITY	550	300
COOLING COILS, SIZE 55, FACE VELOCITY	520	300
COOLING COILS, SIZE 56, 57, 58, FACE VELOCITY	500	300
DIFFUSING TERMINALS, THROAT VELOCITY (NAVY STANDARD)	1,700	900
DIFFUSING TERMINALS, THROAT VELOCITY (COMMERCIAL FLUSH CEILING TYPE) AIR CONDITIONED SPACES	600	300
DUCTS AND BELLMOUTH TERMINALS (THROAT VELOCITY), MECHANICAL VENTILATION OR RECIRCULATION (RECTANGULAR)	3,500	2,000
DUCTS AND BELLMOUTH TERMINALS (THROAT VELOCITY) MECHANICAL VENTILATION OR RECIRCULATION (ROUND)	3,500	2,000
DUCT, NATURAL VENTILATION	3,500	1,000
SUPPLY AND EXHAUST COMMERCIAL GRILLE, OPERATING ROOM	750	750
EXHAUST COMMERCIAL GRILLE, OTHER	1,500	500
EXPANDING CONE TERMINALS	3,000	1,500
FLAME ARRESTERS, FACE VELOCITY	800	400
HEATING COILS, FACE VELOCITY	1,800	NONE
NATURAL VENTILATION OPENINGS THROUGH NON-WATERTIGHT STRUCTURE	1,000 (SEE NOTE 1)	400
NATURAL VENTILATION OPENINGS THROUGH WATERTIGHT OR BALLISTIC STRUCTURE	3,500	1,000
WEATHER OPENINGS, INTAKE, FACE VELOCITY	2,000	1,000
WEATHER OPENINGS, EXHAUST, FACE VELOCITY	2,500	1,500
SLOTTED DUCTS, DISCHARGE VELOCITY	2,000	500
VENTURI TUBES (THROAT)	10,000	3,500

NOTE: 1. 400 FPM VELOCITY FOR USE IN SHOWER SPACES AND WASH ROOMS TO AVOID OBJECTIONABLE DRAFT.

SIZE	FSCM NO.	WT GRP	NAVSEA DWG NO.	REV
A	53711	501	4870232	D
SCALE: N/A			SHEET 29	